RAILROAD GAZETTE

THE STEAM TURBINE SITUATION.

The steam turbine, as a commercial and economical success, is less than 20 years old. It does not follow, however, that the turbine is as far from perfection as the steam engine was 20 years after its inception by James Watt. In the early days of steam engine building, the laws of thermodynamics were not well understood, the facilities for making engines were crude, there were no expert engineers to direct the design and manufacture, and the demand for steam power was limited. All these factors and others tended to retard the art of steam engine building. In fact, only within the past 30 or 40 years has the steam engine been greatly perfected.

The steam turbine has entered the field in the face of a strong competitor, so that what success it has met with has been won by merit. The best performance on record for a steam engine was reported by Prof. Schroeter, of Munich, and Prof. Webber, of Zurich. The tests were made on a triple-expansion four-cylinder horizonal Sultzer engine using steam superheated 230 degrees at 180 lbs. per sq. in. pressure. With a load of 2,860 horse-power the steam consumption was 8.97 lbs. per indicated horse-power per hour, which in this case is equivalent to about 14.25 lbs. of steam per kilowatt per hour. Of course, the above results are not, nor can be, obtained in commercial practice, but they serve to show the possibilities of the steam engine. It is not unusual, however, for large power plants using multiple expansion condensing engines to operate with a steam consumption of from 12 or 14 lbs. per indicated horse-power, which is equivalent to 19 to 22.1 lbs. of steam per kilowatt per hour, assuming a combined efficiency of 85 per cent. for the engine and generator. The steam turbine, by reason of its high rotative speed, is particularly well adapted for direct connection to electric generators. The largest turbine installations, so far, have been built for central power plants, so that in point of steam economy they must compete with the best multiple expansion engines. Steam turbines of 2,600 k. w. capacity, operating with a steam pressure of 185 lbs., a superheat of 186 deg., and a vacuum of 28 inches, have developed an electrical horse-power on 11.02 lbs. of steam per hour which would be equivalent to about 9.38 lbs. of steam per indicated horse-power per hour, a figure which compares favorably with the best steam engine performance, and which is much better than that usually obtained from steam engines. It is now not difficult to design a steam turbine with a guaranteed performance of 14½ or 15 lbs. of steam per electrical horse-power per hour when using steam at moderate pressures, superheated about 100 degrees Fahr., and with a vacuum in the condenser of 27 in.

The steam turbine has certain limitations, but these will no doubt be overcome in time. It is not reversible, its rotative speed is high, and real economy cannot be obtained without a good vacuum in the condenser and without superheated steam. Reversibility is not essential except for marine and some industrial purposes. The high rotative speed is, as before noted, a decided advantage for central power station work, but for many commercial and manufacturing purposes it is objectionable. In those types of turbines which employ a relatively low rotative velocity, the necessity for high degrees of superheat is not so important as in turbines running at high velocity. The function of the superheat in a steam turbine is to prevent fluid friction due to condensation of the steam while passing through the blades. It has been found by the late Dr. Thurston that with a 10 in. disk the loss due to fluid friction amounted to one horse-power for every 275 drops at 200,000 revolutions per minute. In a steam engine the function of superheated steam is to supply enough heat to the cylinder walls to prevent cylinder condensation. In steam turbines cylinder condensation does not have to be considered, and it is therefore found that, although higher economy may be obtained with higher degrees of superheat, a moderate degree is more desirable, as it entails less trouble with the superheaters.

The turbine will probably always hold first place for economy in space. Owing to the perfect balance of the rotating parts, it is not necessary to provide heavy foundations. Furthermore, the turbine has few bearing parts. It has been claimed that the blades wear by erosion but as in hydraulic work, the erosion is proportional to the fluid velocities, and is increased, by moisture in the steam, in the same manner as sand affects the blades of a Pelton wheel. Turbines which run at relatively low velocities have not suffered much from erosion.

A STANDARD COUPLER.

If the Master Car Builders' Association decides to act favorably on the recommendation contained in the President's address to the last convention advocating the adoption of a standard coupler, it will find itself confronted with a task almost as difficult as that which it imposed upon itself seventeen years ago, when it took the first radical step in the solution of the coupler problem and adopted a standard type of automatic coupling. There is not the imperative necessity of action now that there was in 1887, nor will the benefits to be derived compare with the saving in life and in cost of operation which have resulted from the adoption of the automatic coupler instead of keeping the old bull-nose or link and pin couplers in use. Manifold advantages, however, would result from the adoption of one form of coupler as standard, which would warrant to a great degree, at any rate, the time and money which would be spent in bringing about the proposed change. The situation in which the railroads find themselves as a result of the general use of a diversity of makes of couplers grows in seriousness as the number of cars in service increases and action of the sort recommended seems to be the obvious way of affording relief. With the 40 or 50 different makes of couplers at present used, every road which handles cars in interchange is compelled to carry a stock of coupler repair parts representing an investment of thousands of dollars. Much of this stock is seldom drawn upon; nevertheless a supply of parts for all makes of couplers must be kept on hand to insure against delays in making repairs to foreign cars. A large part of the money thus invested is tied up indefinitely and yields no return, but, with a standard coupler in use, the stock of repair parts carried could be reduced to a minimum determined by the average demand for a given period and the money now invested in stocks of couplers and parts would be released for other purposes. Additional economies would be realized by saving space in storehouses and in the care and handling of stock, as well as in the simplification of records and accounts. Perhaps the greatest pecuniary benefit would result from the ease and quickness with which repairs could be made, not so much because of the actual saving in expense, although this would be considerable, as from the direct effect on the earning power of the cars in lessening their detention from service on account of repairs. This would be true not only in the repair yards, but on the road as well, where many costly delays to loaded cars and oftentimes to the trains in which they belong, would be avoided.

Many of the difficulties and obstacles which were encountered when the Association adopted the vertical, plane type of coupler as standard will be encountered again if an attempt is made to pick out from the couplers now in use a standard design which will meet all the requirements of efficiency and strength or to design an entirely new form which would combine the best features of each of several existing makes. It was the original intention of the Association in 1887 to fix upon some one of the very numerous forms of coupling devices which had been brought out by ingenious inventors and to adopt that particular form as a standard. The hopelessness of such a task can well be imagined, for at the time the tests to decide what form was the best were made at Buffalo, some 46 different makes were represented and these were only a few of the three or four thousand attempted solutions which had been patented up to that time. When the tests were made the different couplers were divided into classes, according to their principle of operation and the best that the committee to which was intrusted the task of selection could do was to recommend the type of coupler of which the Janney was characteristic. In its report the committee said:

> These tests and this method of procedure were important steps in the evolution of the subject, because they raised the question from the endeavor to select one coupler from the great number in existence, to a selection from among types as these classes virtually corresponded to types. This advance was very important, because it permits the various railroad companies a range in the selection of what coupler they will adopt in the event of the proposed type being approved by the Association: because it enables inventors to concentrate their abilities on increasing the number of couplers in the preferred type and to devise improvements in those already in existence; it protects railroad companies against extortion, as would be the case if any one coupler instead of a type of couplers interchangeable among themselves was adopted as the standard of the Association.

All of this was undoubtedly true at that time, but it hardly holds as an argument against the adoption of one form of coupler as standard at the present time. The same report says in another place:

> The difficulty has not been to find the best coupler from a large number of very meritorious devices as might reasonably be supposed from ex-

perience with other inventions made in such vast numbers, but to find even one device which did not possess grave disadvantages.

This was notably true at that time and, unfortunately, more or less fits the case at the present time. The President of the Association in making his recommendation for a standard coupler at the last convention pointed out the necessary mechanical features which a generally satisfactory automatic coupler adapted to modern service conditions should embody. These are automatic knuckle opening, automatic locking of the knuckle by gravity when two cars come together under any conditions of track, a positive lock-set and an efficient lock to the lock. It is important that the knuckle will not pull out if the knuckle pin breaks and some provision should be made for taking up wear on the moving parts and those in contact with each other when the cars are coupled. There are, to-day, nearly 8,000 patents on coupling devices and attachments, covering seemingly every possible combination of any merit and many of these are conflicting in more than one claim. It seems hardly possible, therefore to design a new coupler which would embody every point considered essential to a satisfactory device without becoming entangled in legal controversies without end. Of these 8,000 or more patented devices there are perhaps ten makes of couplers now in extensive use which exist by virtue of the principle of the survival of the fittest, and were any coupler fixed upon as standard it would be from among these, or if a new design were prepared it would almost of necessity infringe on some one or more features of these ten. The Janney type of coupler originally adopted was fully covered by patents, but the owners of the patent were prevailed upon to waive their rights to the exclusive use of the contour lines which were adopted as part of the standard. It might be possible to select from the few makes of couplers now in extensive use the best mechanical features of each and so combine them as to obtain the desired result in an entirely new design, but it is not probable that the makers would all agree to waive their rights for little or no consideration and with no assurance of an equitable division of the business of making and selling the new design of coupler. This, however, seems to be the only way around the difficulty, and it remains to be seen whether or not it can be done.

Fully as important as the mechanical design is the quality of the metal of which couplers are made. Cheap couplers can be bought and are bought by some roads with a false idea of economy, on the ground that coupler breakages are becoming so numerous that the least expensive way out of the difficulty is to buy the cheapest makes for replacements. Just as much depends on the quality of material in couplers as in cast-iron wheels and the most expensive in first cost are the cheapest in the end. One large Western road early adopted and has continued to use exclusively a make of coupler containing uniformly high-grade material and its records for the last year show that approximately twice as many coupler failures occurred on foreign cars on its lines as occurred on its own cars on foreign lines. This is a convincing argument for the use of couplers made only of the best material.

A STUDY IN RAILROAD RECEIVERSHIPS.

In a summarized form the returns for receiverships of American railroad properties unfortunately do not go back beyond the year 1876. They do not, therefore, cover the immediate years following the panic of the autumn of 1873. But they do take in the so-called "long drag" up to 1880, following the former year of financial disaster, and thus they allow an inclusion of its effects. Including the year 1903, for which the returns have come in during the present year, there is a total of 28 years through which the subject can be reviewed and the mutations of the figures analyzed. Taken in their entirety and marking their variations, they offer not merely some instructive lessons of the past, but some suggestive hints for the future.

The summary for 28 years, or more than a quarter of a century marked by immense railroad expansion, shows that 652 railroads with 114,855 miles of track, and capitalized at $6,415,055,000 in stocks and bonds, have gone under receiverships. Even allowing for duplicated receiverships of railroad properties, returns which show thus that, in par values, about one-half of the stocks and bonds of the railroads of the United States have gone into the hands of receivers—and about the same ratio of railroad mileage—give us facts of impressive magnitude. There are, of course, qualifying circumstances. Besides the duplicate receiverships referred to, not all the stocks and bonds—especially the stocks—have represented cash paid in; and there have been *pro forma* receiverships and receiverships for "protection of interests" which might, with foresight more wise or more unselfish, have been avoided. Still, the great majority of the receiverships have been the outcome of genuine financial stress and emergency and their striking totals stand to prove the vicissitude of American railroad investment.

Taking the massive figures up in detail it will be found that the receiverships have had three climacteric periods corresponding, as was to be expected, with times of depression in finance and industry, but with somewhat divergent causes back of those periods. That part of the "long drag"—following the crisis of 1873—for which we have the summarized returns, give us the annexed table:

	Miles.	No. of Roads.	Stocks and Bonds.
1876.....	6,662	42	$467,000,000
1877.....	3,637	38	220,294,000
1878.....	2,320	27	93,385,000
1879.....	1,102	12	39,367,000
1880.....	885	13	140,265,000
Total.....	14,606	132	$960,311,000

The second high point in what may be called the receivership curve appears during the three years, 1883-85, inclusive, and gives the following returns:

	Miles.	No. of Roads.	Stocks and Bonds.
1883.....	1,990	11	$108,470,000
1884.....	11,038	37	714,755,000
1885.....	8,286	44	385,460,000
Total.....	21,314	92	$1,208,685,000

The third period, and one very striking in both the relative and absolute amount of the entries, is expressed in the table subjoined.

	Miles.	No. of Roads.	Stocks and Bonds.
1892.....	10,508	36	$357,692,000
1893.....	29,340	74	1,781,046,000
1894.....	7,905	38	395,791,000
1895.....	4,089	31	369,075,000
1896.....	5,441	34	275,597,000
Total.....	56,383	213	$3,179,201,000

The three brief tables, whether taken together or apart, are extremely interesting. Thirteen out of the 28 years of receiverships return stocks and bonds involved of $5,348,197,000, or about 83 per cent. of the total, corresponding figures for mileage being 92,303, or about 80 per cent., and for number of roads 337, or somewhat more than one-half the total number. If we take up the causes and apply them to the three periods, the first must be assigned almost exclusively to the fever of railroad construction which led up to the panic of 1873; the second period to speculative collapse of a much more general type; and the third period to both the foregoing causes, combined to which are to be added, as very important factors, the disturbance in national finances with the silver question in the foreground and the "currency famine" of 1893 as one of the unique phenomena. Logically, with three such potent causes of disaster blended, the third period looms large in its returns, which show, for only five years, receiverships for 213 roads with 56,383 miles and $3,179,201,000 in stocks and bonds—about one-half the total of stocks and bonds for the whole period of 28 years. The dark year, 1893, with its 74 roads, mileage of 29,340, and stocks and bonds of $1,781,046,000, in this connection is to be especially noted.

If we take the year 1873 as the beginning of the first receivership epoch, the returns show the receivership periods almost exactly ten years apart. It is, doubtless, to a large extent a coincidence. Yet the fact may be recalled that during the high swell of speculation of three or four years ago some of the best financial prophets were forecasting panic and collapse at just about the time which would have filled out another decade. Happily the panic has not come. The wave of speculation rolled high but did not break, and there has been instead a quiet recession of the tide and a steady but not sharp shrinkage of market values which has left few wrecks and almost no railroad receiverships behind it, notwithstanding the new era of "high finance" in railroads. The causes of the happy avoidance of disaster are not far to seek in the better organization of American capital to avert panic and the more solid industrial prosperity of the country. But when, at a time which no man can fix, and which, we trust, is far away, another receivership period dawns, it may be interesting as well as pathetic to observe the effects on "holding" corporations and on railroad systems in which hundreds of millions of bonds with foreclosure powers have been substituted for old dividend-paying stocks.

When that inevitable period comes there will be yet another element to be studied and reckoned with. According to recent computations the street railways of the country have reached the enormous capitalization of $1,700,726,898 in stock and $1,401,664,048 in bonds, or $3,102,390,946 in the two sets of securities together. When the street railways, with their great over-capitalization, pass through the ordeal of a receivership period, some questions of import will be raised. Will such a period synchronize with a time of trouble in the steam roads also, or will it be a thing apart? How long will it be belated by the popularity of electric railway travel? How far will it reach down in fore-

closure proceedings, and shall we see the theory of "protection of interests" repeat itself, or will senior mortgages, in general, take the properties and reorganize them, and, if so, on what basis? These questions will be answered in time, and meanwhile we face, as a salient and conspicuous fact, such a rapid and large expansion of street railway properties that their problems in magnitude begin to mate those of the steam roads, and, in many respects, are more complex and nebulous.

The most specific single lesson in the Government's eleventh accident bulletin, which is given on another page, is that train orders containing references to the second section of a train are peculiarly liable to be misread. Four collisions have occurred within a year in consequence of men reading orders and not seeing the word "Second," though it was undeniably there. Whether the readers were unusually careless or the penmen were particularly slovenly does not appear; and it does not much matter, for every superintendent knows that both in writing and in reading, his only safe course is to persistently follow up the work of all of his men, both operators and trainmen. Careless work on both sides is, unfortunately, too common to escape notice, unless the superintendent deliberately shuts his eyes. One thing, however, which might be done, and with little loss of time, would be to require such orders to be written "Second (2d)," and to require operators to leave a wider margin. One engineman offered the excuse that his thumb covered the word that he failed to see. Perhaps the only practicable way to secure wide margins would be to use larger sheets. Possibly a rule should be adopted requiring the use of the words "the" and "section" ("the second section of twenty-seven"). Does any one say that this would be clumsy and slow? Granted. But why not admit frankly that the despatching system is very weak unless it is elaborate and time-consuming? Those who have made full use of the block system do practically admit this —to themselves. And they also admit that the block system is the only practicable remedy. Bulletin 11 is significant in one other feature: two collisions, numbers 1 and 5, injuring seven persons and damaging road and equipment to the amount of $6,200, were caused by despatchers' mistakes. Despatchers represent—or they come as near as any department to representing—a well-managed department; the men are selected from a large number who have been tried in train work, they are not usually overworked, and they are probably as conscientious and energetic as any similar class of men; and yet these costly errors are frequently reported. In fact, the moral, "Adopt the block system," is forced on the attention by the collision record at every turn. Two accidents reported in Bulletin 11, costing $21,900, were caused partly by a very unusual occurrence, the freezing of packing leather in air-brake cylinders—a result of the remarkably severe temperatures of last January.

Some ten years ago at the outset of a period of business depression President Clark, of the New York, New Haven & Hartford, expressed himself as deeply amazed at a sudden falling off on his road in the summer traffic, which, on its face, was related to pleasure rather than business. If the report is true that the summer business of the New Haven Company shows a falling off of something like 25 per cent. as compared with last year, President Mellen must be running much the same gauntlet of feeling as President Clark and sees an economic necessity for the wholesale and radical reductions of train service which he has ordered and which have roused the communities on his lines to vigorous protest. There is nothing, however, very phenomenal in this particular aspect of the situation. The New Haven system serves an immense summer population on the shore and in the rural uplands. Part of it, undcubtedly, has been affected by the St. Louis Exposition and another part is responsive to such industrial depression as affects Fall River and other New England factory centers; while business travel, merged with summer traffic, and, to some extent indistinguishable from it, reflects the same influence. But, in economic aspects, there are larger things which President Mellen has to consider. Paradox it may be, but the more than half century old New Haven system under his policy is in a state of radical transition. He has a big and novel electric policy, an intricate and expansive scheme at Poughkeepsie bridge and beyond, bridge reconstruction on a vast and expensive scale, new rolling stock to buy antecedent to his theory of the heavier train load and a medley of allied problems to be worked out. All these signify expenditure synchronous with the maintenance of an 8 per cent. dividend, which the holders of what has been called in Connecticut an "Old Maid's Stock" demand. The reduction of trains is probably not a cheerful ordeal for President Mellen to face at a time when the echoes of the welcomes at Board of Trade dinners have hardly died and when but a few months must lapse before he asks a Connecticut legislature to change the four-day car detention law; and irony, as regards his passenger train service, can find its theme in the rich promise of his coming and a certain aridity of fulfillment. But time alone will tell whether he has bought the remoter good by the immediate evil, and as head of the waxing New Haven system, President Mellen is yet young.

Prince Khilkov, the Russian Minister of Transportation, reported that June 1, 34 additional sidings or passing tracks had been completed on the Siberian Railroad, and that it was possible to despatch 12 trains each way daily the whole length of the road; while 69 more turnouts were under construction. Rewards are offered to the contractors on the line around the south end of Lake Baikal for the early completion of their contracts, and the reports of the time of its probable completion vary from the middle of August to "in time for the winter traffic" —which latter would be a great misfortune, for men and supplies for the whole winter should be in Manchuria before winter sets in. To strengthen the operating force, 700 enginemen, firemen, switchmen, etc., have been transferred from the Transcaucasian Railroad alone, and so much rolling stock has been taken from the European lines that it is feared that they will be crippled for their grain traffic after harvest.

The semi-annual statistics of pig-iron production, compiled by the American Iron & Steel Association, reflect accurately the retrenchment characteristics of the present industrial period. Yet, although the unsold stocks have increased somewhat since the last half year, and very greatly since the boom ending about a year ago, there is nothing panicky about the figures, and the decrease in total output, amounting to a decline of 1½ per cent. from the last half of 1903 and of 15 per cent. from the first half of 1903, is not alarming. Eleven years ago, when there was genuine stringency, pig iron production fell off 41 per cent. in the same period, while at the present time, although railroads and manufacturing interests everywhere in the country are on the lookout for economies and are restricting new work as much as possible, it is noteworthy that the iron production, in spite of the decrease from 1902 and 1903, was greater than in any six months previous to the latter half of 1901, and nearly equaled the entire twelve months' output of as recent a year as 1896.

NEW PUBLICATIONS.

Boiler Construction, by Frank B. Kleinhaus, first edition, 1904. The Derry-Collard Company, New York. Four hundred odd pages, including 334 illustrations and five large plate engravings. Price $3.

This book gives a practical explanation of modern methods of boiler construction from the laying out of the sheets to the completed boiler. It includes detailed descriptions and drawings of boiler fittings, such as check valves, whistle valves, fusible plugs, blow-off cocks, water glass, throttle lever, etc. The line drawings and half-tones are well selected and clear. There are 55 pages devoted to illustrations, descriptions and care of boiler-shop machinery, considering the limited space the selections of the machines are good. The book closes with a number of tables, including areas and circumferences of circles, logarithms of numbers, natural tangents and sines, tensile strength of bolts, weights of material, etc.

Association of Transportation & Car Accounting Officers: Proceedings of the Washington meeting: G. P. Conard, Secretary, 24 Park place, New York.

Secretary Conard has issued the first publication of this new association, being the record of what was done at Washington, May 24 and 25, when the Car Accountants' Association and the Railway Transportation Association were disbanded and the new association organized. The pamphlet contains, besides reports and discussions, the constitution of the new association, the names of the officers of both of the old associations from their organization, in 1876 and 1899, respectively, and a digest of those recommendations of the old associations which are still of interest.

TRADE CATALOGUES.

Bettendorf Axle Company, Davenport, Iowa, is sending out an attractive catalogue of its trucks, bolsters, tank cars, underframes and railroad specialties. The truck, tank car and car for the Illinois Tunnel Company were illustrated and described in the *Railroad Gazette*, June 10, 17 and 24, respectively. The catalogue contains a series of half-tone illustrations from photographs showing the rapidity with which the truck may be dismantled and reassembled. There is also shown a tender truck similar to the car truck, but having some additional features of novelty. Bolsters are quite fully illustrated and described and some discussion of the bolster problem given, including a series of curves showing the results of static and drop tests on several types and capacities of bolsters. The book contains 50 pages and is neatly designed and printed.

The American Locomotive Company has issued a pamphlet which describes their ex-

hibit at the Louisiana Purchase Exposition. Their exhibit consists of 12 locomotives which represent the present tendencies of American design and which include the four-cylinder balanced compound locomotive built for the New York Central for high-speed passenger service and the four-cylinder articulated compound locomotive built for the Baltimore & Ohio for heavy freight service. The last-named engine is the heaviest and most powerful locomotive built. The pamphlet opens with descriptions and drawings of the important details of these engines and is followed by a full-page half-tone illustration of each engine exhibited and the essential data concerning them. A diagram showing the company's method of classification of locomotives and an explanation of the same is given on the last page.

The Passenger Department of the *Michigan Central* has prepared an appropriate and attractive folder in honor of the G. A. R. encampment at Boston, August 15 to 20, inclusive. It contains a number of good half-tone views of interesting and historical points and scenes in Boston and along the route; also some reproductions of old prints of events connected with the early history of Massachusetts. The program for the week is given and also full information as to rates, side trips and 21 different routes that may be chosen.

The Penn-Allen Portland Cement Company, Allentown, Pa., sends a pamphlet in which is given a description of their works at Penn-Allen, Pa. Their property consists of about 160 acres of land which is rich in limestone and cement rock. The buildings are of concrete steel construction. The works have a capacity of 1,000 barrels per day, and it is the company's intention to double their capacity in the near future. A number of interesting tests of the cement are given.

The Joseph Dixon Crucible Company has just issued their August number of "Graphite," which is devoted to a description of the different forms of graphite and their respective uses. A copy can be procured free of charge by all persons interested in the subject.

The United States Metallic Packing Company, Philadelphia, Pa., has issued a catalogue describing their packing for marine and stationary engines. A full, detailed description and illustration of the packing is given.

CONTRIBUTIONS

Power Distribution in Automatic Signaling.

Swissvale, Pa., July 27, 1904.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Mr. H. S. Balliet's last article, entitled "Performance of Automatic Signals Under Unfavorable Conditions" (*Railroad Gazette*, July 8, page 135), while ably written and deserving of careful consideration by all railroad men interested in automatic signaling and in the natural trend of development in this direction, is nevertheless open to question in a few of its statements.

First: Contrary to the report of the Railway Signal Association referred to by Mr. Balliet, the economical use of storage cells charged through power lines is distinctly advantageous over the use of primary cells for the operation of modern motor signals controlling blocks of one mile in length upon single and double track roads.

Second: The use of one set of storage cells for the joint operation of two or more block signals is not advisable where the set constitutes one of a series charged through a power line from a central station, unless each set can be economically adapted to the operation of a sufficient number of signals (or other devices) to entail from each an approximately uniform rate of discharge. Each set of batteries so arranged should be in duplicate, so that each may be alternately transferred from the charging line to the service circuits without at any time forming electrical connection between the charging line and that set of batteries in service, if the best results are to be secured.

Third: Conditions undoubtedly now exist and will continue to exist which preclude the economical use of storage batteries in this capacity charged from central points through wire lines. The use of portable storage cells, periodically removed to convenient power centers for charging, is a method to be then adopted, provided, however, the period of activity of the cells without re-charging can be extended over a month or more without incurring undue risk of serious sulphating, which inevitably shortens the life of the battery.

To what extent storage cells can be economically substituted for primary batteries under conditions which preclude the charging of the former from central stations through line wires cannot well be stated in general terms, but there is no gainsaying the fact that the method may be employed under many conditions advantageously. The method, however, can never be so advantageous, from a purely engineering point of view in the maintenance of the batteries themselves, as the use of batteries permanently located at the signals, to be charged at frequent intervals at a moderate rate and from central points through suitable conductors.

Fourth: Mr. Balliet wrongly, though evidently unintentionally, states that portable storage cells can be charged at electric interlocking plants (in conjunction with the batteries of the interlocking, and by means of the generator provided for the batteries of the interlocking) "with no additional cost for fuel or attendance." Waiving the question of attendance, in which he is probably right, it is evident that in the matter of fuel he is wrong, for the generator, if of an ampere capacity equal to the needs of the interlocking batteries only, must be run solely for the signal batteries when these are being charged; or, if of ample ampere capacity for the simultaneous charging of *both* sets of batteries must develop a greater horse-power when charging both than when charging the interlocking batteries alone—a feat impossible without additional consumption of fuel. Mr. Balliet no doubt intended to imply that the additional fuel consumed under these circumstances might reasonably be ignored as being too small to materially affect the conclusions to be reached, though the writer does not feel that even this statement should go unchallenged where it pertains to comparative costs of two methods.

Air Mains.—Concerning the rupture of pipe lines of pneumatic block systems during the past winter, referred to by Mr. Balliet as an argument against systems depending upon power developed at central points, it is only fair to state that this trouble was not common to all localities nor to all plants in the same locality, but was peculiar only to several plants installed from 10 to 15 years ago, in which due provision for expansion and contraction under the extreme temperatures prevailing during the past winter had not been made. Modern plants such as those on the Philadelphia division of the Pennsylvania Railroad and on the Philadelphia, Baltimore & Washington, more recently installed, were not only entirely exempt from this character of trouble, but were also absolutely free from trouble arising from frozen condensation within the air system. Users of pipe lines are fully aware of the several obvious courses to pursue in guarding against the trouble in future.

J. P. COLEMAN.

Pig Iron Production, First Half of 1904.

According to the *Bulletin* of the American Iron & Steel Association, the total production of pig iron in the first half of 1904 was 8,173,438 gross tons, against 8,301,885 tons in the last half of 1903 and 9,704,367 tons in the first half of 1903. The decrease in production in the first half of 1904, as compared with the second half of 1903, amounted to only 128,447 tons, but, as compared with the first half of 1903, it amounted to 1,533,929 tons. The united production of the second half of 1903 and the first half of 1904 amounted to 16,475,323 tons, against 18,720,100 tons in the second half of 1902 and the first half of 1903, when the boom was at its height, a falling off of 2,244,777 tons. And yet the production in the first half of 1904 was greater than in any half year prior to the second half of 1901.

Classified Production.—The production of Bessemer pig iron in the first half of 1904 was 4,530,946 gross tons, against 4,509,289 tons in the last half of 1903 and 5,480,619 tons in the first half of 1903. The figures for the first half of 1904 include 87,582 tons of low-phosphorus pig iron, against 110,699 tons in the last half of 1903 and 89,723 tons in the first half of that year.

The production of basic pig iron in the first half of 1904 was 1,061,901 gross tons, against 836,923 tons in the last half of 1903 and 1,203,803 tons in the first half of 1903. Basic pig iron made with charcoal is not included in these figures.

The production of charcoal pig iron in the first half of 1904 was 213,356 gross tons, against 272,040 tons in the last half of 1903 and 232,717 tons in the first half of 1903. In addition there were produced in Wisconsin and Washington 927 tons of mixed charcoal and coke pig iron in the first six months of 1903. No iron has been made with this fuel since the first half of 1903.

The production of spiegeleisen and ferromanganese in the first half of 1904 was 114,206 gross tons, against 81,986 tons in the last half of 1903 and 110,675 tons in the first half of 1903. The production of ferromanganese alone in the first half of 1904 amounted to 26,541 tons, against 14,118 tons in the last half of 1903 and 21,843 tons in the first half of that year. In addition to the above Tennessee made 304 tons of ferrophosphorus in the first half of 1904.

Production by Fuels.—The production of bituminous coal and coke pig iron in the first six months of 1904 amounted to 7,337,279 gross tons, of anthracite and coke mixed to 607,624 tons, of anthracite alone to 15,179 tons, and of charcoal to 213,356 tons. Included in the bituminous figures is a small quantity of ferro-silicon made with electricity.

Unsold Stocks.—The statistics of unsold stocks do not include pig iron sold and not removed from the furnace bank, or pig iron manufactured by rolling-mill owners for their own use, or pig iron in the hands of consumers. The stocks which were unsold in the hands of manufacturers or their agents or were under their control in warrant yards or elsewhere on June 30, 1904, amounted to 623,254 tons, against 591,438 tons on December 31, 1903, 126,301 tons on June 30, 1903, and 49,951 tons on Decem-

ber 31, 1902. On June 30, 1904, the American Pig Iron Storage Warrant Company had 78,600 tons of iron stored in its various yards, virtually all of which was controlled by the makers, and all of which is included in the 623,254 tons of unsold iron reported on that date. On December 31, 1903, the company had 47,200 tons in its yards, of which 40,149 tons were controlled by the makers and 7,051 tons were in other hands. No pig iron whatever was stored in its yards on June 30, 1903, or on December 31, 1902.

Furnaces in Blast.—The whole number of furnaces in blast on June 30, 1904, was 216, against 182 on December 31, 1903, 320 on June 30, 1903, 307 on December 31, 1902, and 286 on June 30, 1902. The number of furnaces idle on June 30, 1904, was 209. Of the active furnaces on June 30, 1904, 170 used bituminous fuel, 26 used anthracite coal and coke mixed, 2 used anthracite coal alone, and 18 used charcoal alone.

New Stations on the St. Louis & San Francisco.

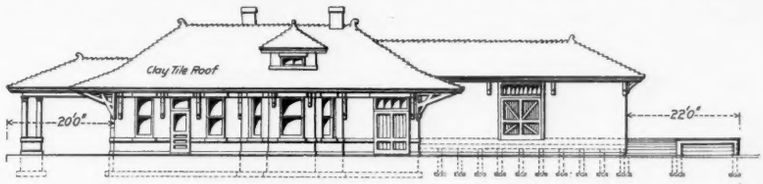
The St. Louis & San Francisco has built 10 or 12 new passenger stations at different points on its main and branch lines in the last two years, some of which are fine examples of modern station architecture. Most of the buildings for the smaller towns and cities are modifications of a standard design and two examples of such stations are shown in the accompanying plans, the one at Bloomfield, Mo., being a combination passenger station and freight house. The stations at Ft. Smith, Ark.; Wichita, Kan., and Tower Grove avenue, St. Louis, are each of special design and are particularly handsome.

The standard design of building for small stations, similar to the Bloomfield and Chickasha stations, is a one-story pressed brick building with cut stone trimmings, corrugated clay tile roof and wood trimmings. The arrangement inside is substantially the same in all. The agents' office is in the center on the track side and extends out in a bay beyond the building line to give a clear view of the track. The baggage room occupies the whole or part of one end of the building and a general waiting room the other end. The main entrance is from the porch or covered platform at the end of the station, opening into the general waiting room. Doors open out to the train platform from the general waiting room and smoking room and an entrance from the rear of the stations is also provided in the general waiting room. The baggage room has sliding doors opening out to the train platform and to the rear of the station also. The roof is carried out 8 ft. beyond the walls to protect the platforms on all four sides. It is supported on ornamental wood brackets. The train platforms in front of the stations are 16 ft. wide and beyond the station at either end are 10 ft. wide. They are concrete and are 300 ft. long. A 10-ft. walk is built around the other three sides of the building and also beyond the covered platform, as in the Chickasha station.

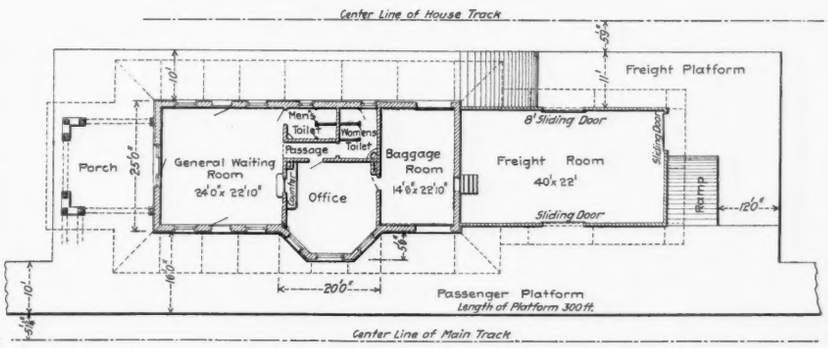
In the combination stations, such as the one at Bloomfield, the freight house is built of wood, sheathed with corrugated iron plates and covered with a tile roof. A raised wooden platform with inclined runways from the street and train platform is built along the rear side and the end. The floor of the building is on a level with the loading platform.

The new station at Ft. Smith, Ark., is the most imposing of any of the new structures. It replaces an old wooden station and is situated a block further west at the corner of Garrison avenue. It is built after the Ionic style, of white dressed stone closely resembling marble, which is quarried near Carthage, Mo. The colonnade at the front faces on Garrison avenue and the portico is supported on ten massive columns with Ionic bases and caps extending up to the full height of the building, arranged in two groups of three columns each, in the center, and flanked by single columns at the corners of the portico. The main part of the building is two stories high, the upper floor being occupied with the offices of the trainmaster, roadmaster and train despatcher.

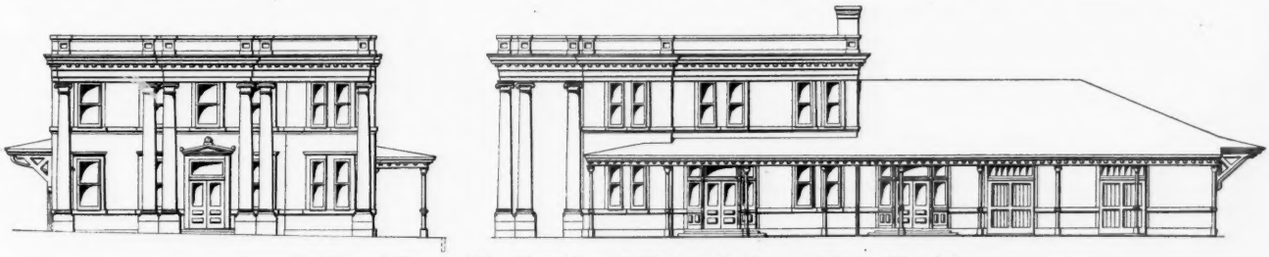
The entrance to the station opens into the main waiting room, which is 26 ft. x 36 ft. 3 in. The ticket office is in one corner, a women's rest room occupies another corner



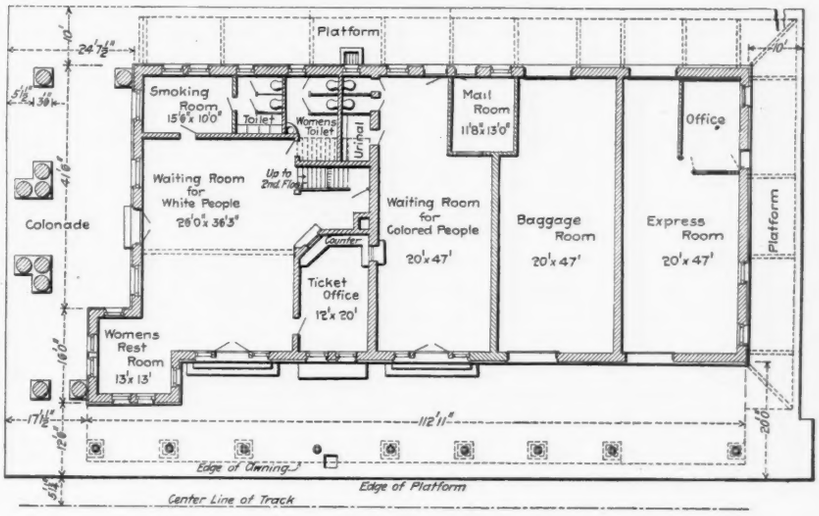
Track Elevation.



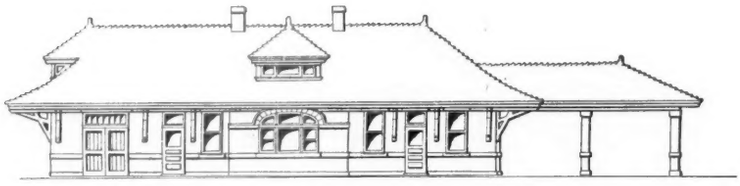
Plan and Elevation of 'Frisco Combination Depot at Bloomfield, Mo.



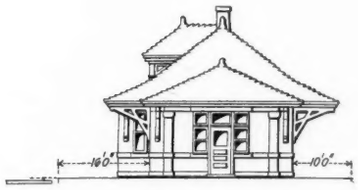
Front and Track Side Elevation of 'Frisco Station at Ft. Smith, Ark.



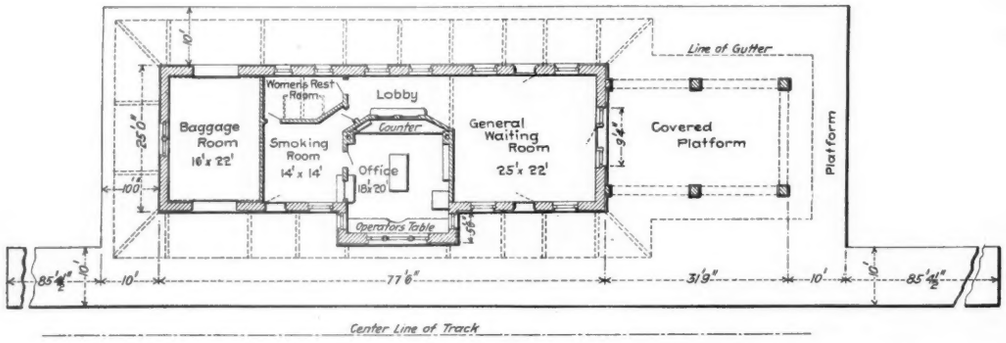
First Floor Plan of 'Frisco Station at Ft. Smith, Ark.



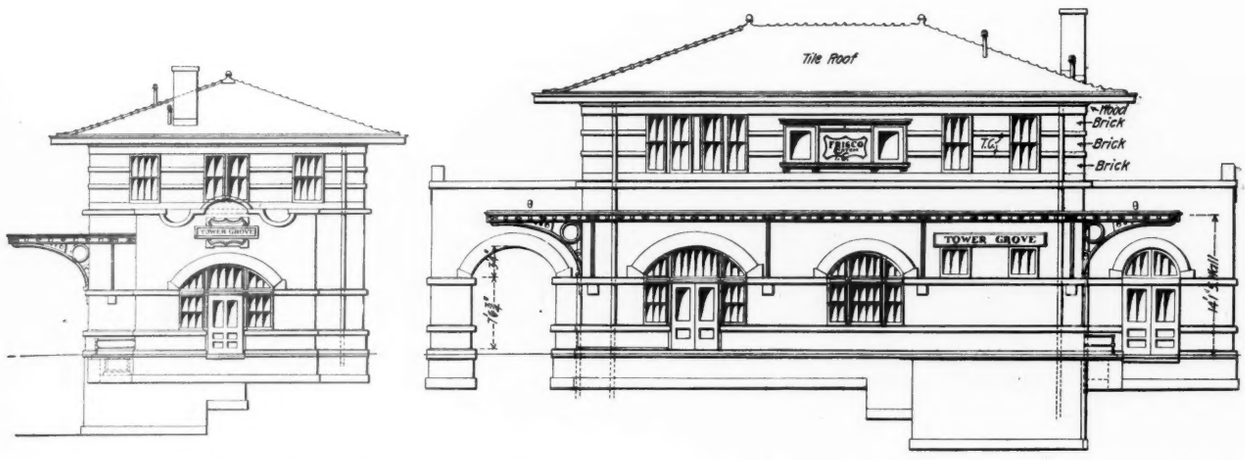
Track Elevation.



End Elevation.



Plan and Elevations of 'Frisco Station at Chickasha, Ind. T.



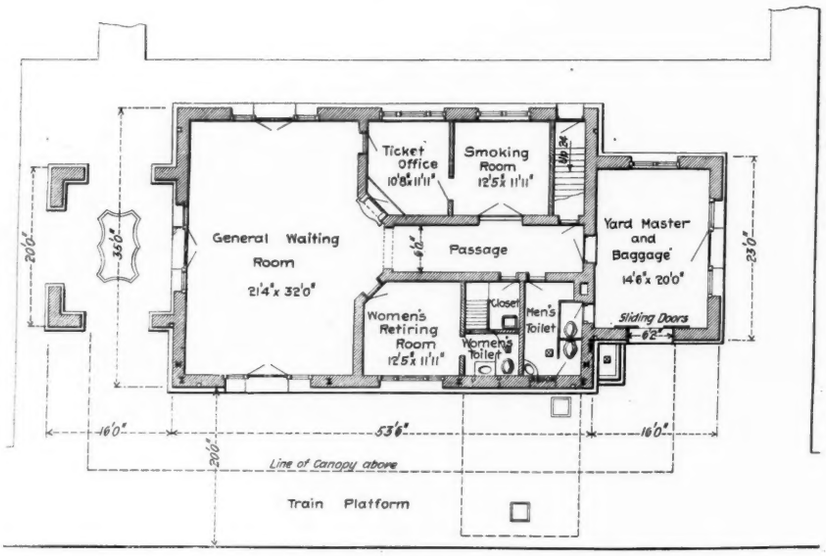
End and Track Elevations of 'Frisco Station at Tower Grove Avenue, St. Louis, Mo.

and the smoking room and men's and women's toilet rooms are along the south wall. The tracks run along the north side of the building and the platform, which is 20 ft. wide, is covered with an awning supported by columns under the gutter. A wide, double door opens from the main waiting room out to the train platform.

The rear of the building is occupied by the colored people's waiting room, baggage and mail room and express room, all opening out on the train platform and also onto a loading platform on the back side, which is protected with an awning supported on wooden brackets. This part of the building is one story high, with a sloping slate roof.

To reduce the expense as much as possible all of the ornamental moldings, caps and other intricate parts were made of Algonite, an artificial concrete stone, made by the Algonite Stone Company, of St. Louis. The pillars are concrete faced with mortar tinted to match the stonework. The interior finish of the building is hard pine and cypress rubbed with oil. A. Anderson & Company, of St. Louis, were the contractors. The station was finished and was put into use about the first of the year.

The Wichita, Kan., station was finished last year and is quite as large and com-



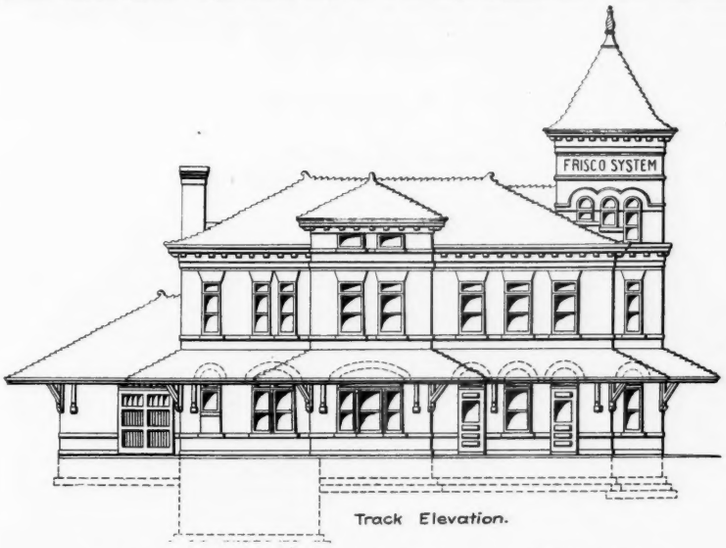
First Floor Plan of Tower Grove Avenue Station.

modious as the Ft. Smith station, although not departing far from other designs in its exterior or interior appearance and arrangement. It is also a two-story building with exterior walls faced with stone and backed with brick. The principal entrance is from Douglas avenue, through a portico under the tower. The main waiting room is 26 ft. x 35 ft. In the center of the building on the first floor are the ticket offices on the track side and a wide hallway on the other, from which two stairways lead up to the offices above. The south end of the building is occupied by the smoking room and women's rest room with the toilet rooms. A passageway 5 ft. wide separates these two rooms and leads into a lobby connecting over a counter with the baggage room, which is a one-story structure built on the station building. A concrete platform runs around the entire building and is protected with a shelter roof supported from the walls on brackets. On the upper floor are the offices of the train despatcher and the district freight and passenger agents.

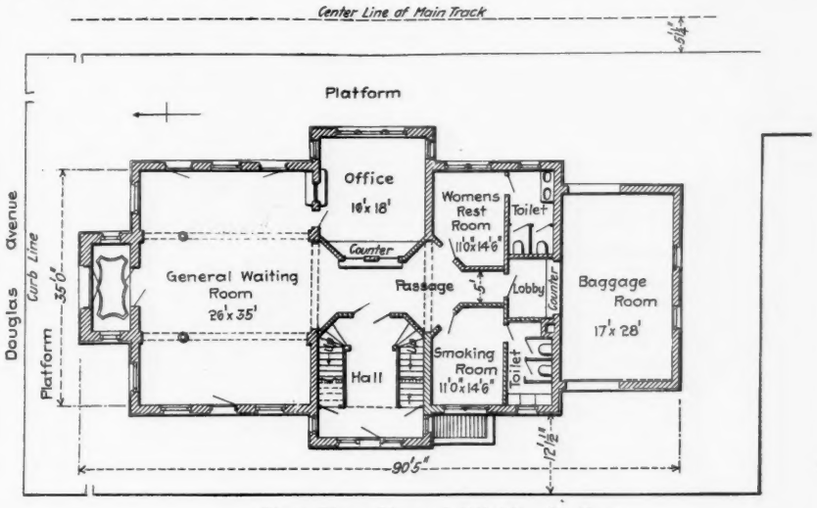
The new station at Tower Grove avenue, St. Louis, has just been completed and is an exceptionally handsome one. It is located at Tower Grove avenue on the north side of the main line tracks of the 'Frisco in the residence district of the city, about three miles from the Union Station and serves a good part of the traveling public in and out of St. Louis. All trains stop at this point to take on and let off passengers. The new building is two stories high, of pressed brick with terra cotta trimmings and tile roof. The entrance is through a portico at the west end, which opens into the main waiting room, 21 ft. 4 in. x 32 ft. Leading off this room is a passage way 6 ft. 4 in. wide, through to the baggage room at the other end of the building. The ticket office and smoking room are on one side of this passage and the women's retiring room and the toilet rooms are on the other. The waiting room and passageway have mosaic tile floors and enameled brick wainscoting 5 ft. high around the walls. All the other rooms have maple floors and plaster finish.

On the second floor are offices for the train despatcher and superintendent of terminals and their clerks. The building is surrounded by a concrete platform and has an ornamental shelter canopy extending out over the platform on the track side. This is held up by iron brackets built into the wall. Suitable tablets of terra cotta with the name of the railroad and the station name are built into the walls over the entrances. Eames & Young, St. Louis, were the architects for this building, but all of the others were designed by C. M. Roquette, the railroad company's architect.

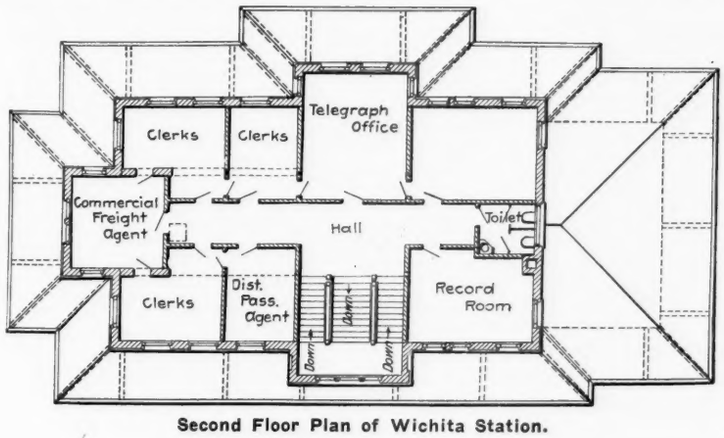
We are indebted to Mr. C. D. Purdon, Chief Engineer, for the drawings.



Track Side Elevation of 'Frisco Station at Wichita, Kan.



First Floor Plan of Wichita Station.



Second Floor Plan of Wichita Station.

Foreign Railroad Notes.

In the Prussian House of Lords the Minister of Public Works reported that the surplus of net earnings of the State railroads for the year ending with April last was $144,704,000, while his estimate at the beginning of the fiscal year was that it would be $118,286,000, and he begged pardon for his error. The returns on the capital invested were 7.3 per cent. The Minister recommended an appropriation of 3,000,000 marks ($714,000) to the employees' sick fund; which was granted.

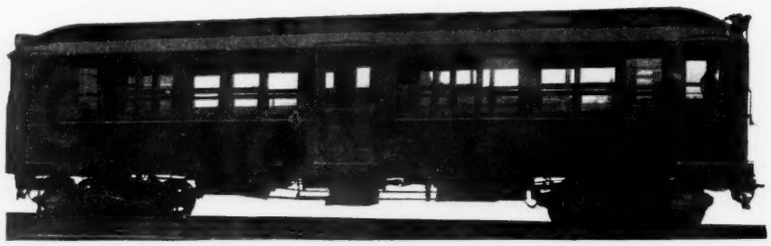
He spoke of the possibility that the State might soon begin the construction of a new kind of railroad, interurban railroads, between considerable cities, to be worked by electricity at great speed on the open road (38 to 50 miles an hour), but with the cars running over the street railroad at the two termini, and, of course, low speeds, which is certainly the rational way to make such lines convenient to the passengers. Frankfort and Wiesbaden were named as places suitable to be connected by such a line. Wiesbaden has about 60,000 inhabitants, and Frankfort 290,000, and they are 26 miles apart.

The East African Railroad Co. has been formed by a syndicate of German bankers and other capitalists to build the railroad from Dar-es-Salaam, on the coast, westward to Mrogoro, for which the German Empire has guaranteed interest and principal of 21,000,000 marks ($4,998,000). This is expected to make accessible the comparatively healthy interior of German East Africa, by affording quick and comparatively cheap transit through the low country near the coast.

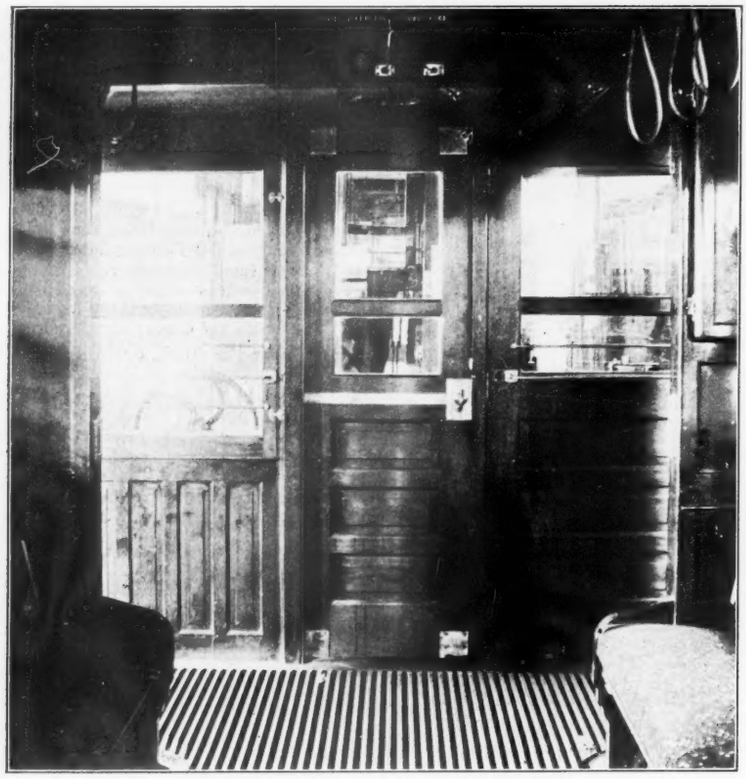
New Cars for the Boston Elevated.

The Boston Elevated Railroad has recently received from the St. Louis Car Company 24 cars of a design which embodies a number of changes from the so-called Manhattan type. The equipment now in use on the Boston Elevated has a wide sliding door in the middle of the car on each side, and open-end platforms enclosed by gates, which swing back against the platform railing of the car when operated by levers handled by the brakemen standing on the platforms between the two cars. During the rush hours, when the platforms are crowded, these gates are opened and closed only after much pushing and crowding on the part of passengers and delay to the train at the station. The doors in the end of the car also form a restricted passage, which impedes the easy access and egress of passengers. Side doors in the cars assist somewhat in taking on and letting off passengers at busy stations, but they require a guard for each car on each station platform to open and close them, besides the regular guards on car platforms. The new cars for the Subway in New York are built with an enclosed end platform and sliding doors, but the narrow door in the end of the car has been preserved and no side doors in the middle of the car have been provided.

The new cars of the Boston Elevated have been built without platforms at the end; that is, the platform has been enclosed and the end bulkhead of the car body has been removed, making the platform practically a part of the car. Sliding doors instead of gates are provided and a narrow sliding end door has been built in the end of each platform, so as to give access from one car to another, but these doors are intended to be kept closed and to be used only by the brakemen. The end side doors are operated by compressed air drawn from the air-brake system. An air cylinder which has a stroke equal to the width of the door opening is placed in the side of the car just under the side plate. The piston which works in this cylinder is attached to the top of the door and a spring latch is provided to hold the door in place. The foot lever controlling this latch and the valve controlling the door operating cylinder are mounted on the outside of the end of the car. To open the door the brakeman presses on the foot lever, which unlocks the spring latch; then, by operating the air valve he admits air in front of the piston, which forces the door open. When the door is opened fully the valve handle is returned to its mid-position and the air is exhausted from the cylinder. To close the door the valve is turned in the opposite direction, and air is admitted back of the piston. In order to prevent passengers from being injured by the door when it closes, or from having their clothing caught between the door and the jamb, a pneumatic cushion 1 11/16 in. in diameter is fastened along the edge of the door, and this forms a waterproof joint when the door is closed. Any clothing which is caught can be easily removed. A rubber cushion is also fastened along the back edge of the door to take up the shock of the door's closing.



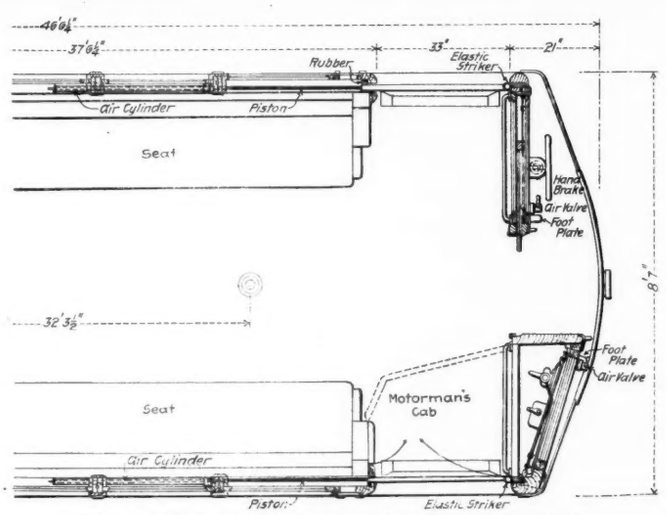
New Type of Car for the Boston Elevated.



Interior View of End of New Cars for the Boston Elevated.

This arrangement of enclosed platform and sliding doors permits a considerable increase in speed of handling passengers in and out of the cars and adds greatly to their comfort by providing a space wide enough for two lines of people to enter the body of the car without crowding or crushing. The interior carrying capacity of the car is also largely increased. Instead of having to cross over both platforms, the brakeman can make station announcements without leaving his place between the two cars. The motorman's cab is formed by two folding doors, one of which folds back against the end of the platform and encloses the brake and controlling apparatus when the car is not in the head end of the train. The other door folds back against the end of the car body.

We are indebted to Mr. C. S. Sergeant, Vice-President of the Boston Elevated Railroad Company, for the illustrations and details of the description.



Plan of End of New Cars for the Boston Elevated.

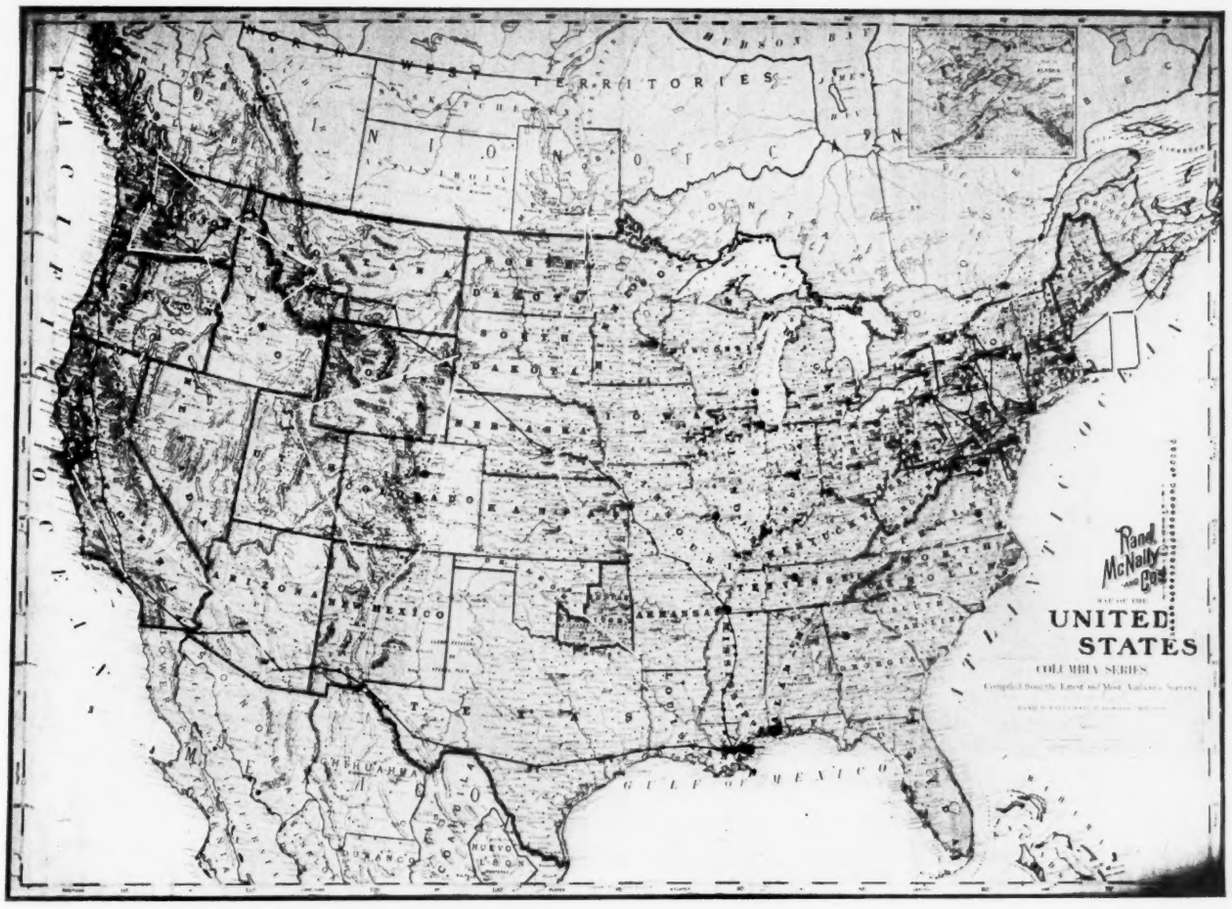
The Tropical Fruit Traffic.

Within the last few years the United Fruit Company, which is now in control of probably 75 per cent. of the banana business in this country, has built up so important an industry and one of so unusual a character that it is of special interest to the rail transportation lines. It is only a short time, relatively speaking, since bananas were scarce everywhere except in the cities along the Atlantic and Gulf ports, and were to be classed rather as a tropical luxury than as a staple article. Although shipped green, it was of the utmost importance that they should be handled with great care and with great rapidity, and until the plantation methods, the shipments and the rail connections were thoroughly harmonized the loss of the fruit in transit greatly restricted the territory to which they could be delivered at a low price.

The United Fruit Company was organized in March, 1899, and in the year following approximately 15,000,000 bunches of bananas were shipped from Jamaica, Costa Rica and the plantations in Cuba, Honduras, etc., a quantity which at that time was looked upon as being extremely great. Yet in four years the business was so developed that in 1903 it amounted to 23,413,892 bunches, while preliminary estimates for the year ending September 30, 1904, indicate that the total shipments will aggregate about 26,000,000 bunches. The company now works a fleet of 83 steamers, collecting fruit from a number of points in Central America, from Cuba, Jamaica, Haiti and Santo Domingo, and delivering it at New Orleans, Mobile, Charleston, Norfolk, Baltimore, Philadelphia, New York and Boston by direct lines. Some of the newer steamers in the company's fleet are provided with air blast ventilation, but in the majority of cases the ship's ventilators supply all that is necessary. On the smaller vessels, the hold as a rule contains only two layers of bunches, which are set on end, one above the other. This is the ordinary method of packing the fruit, although in some cases, where the lower deck is also used, the top layer of bunches is laid flat on those standing.

In either case a considerable air space is left between the top of the fruit and the deck overhead. The care with which this kind of a cargo must be handled, precludes even the use of steam winches or of any kind of labor-saving device, so that a large force of men is required to load and unload the ships. Five gangs of 25 men each are similarly tallied as they are placed on board the fruit car or truck at the dock, and the tally and the invoice are audited together, after the fruit has been delivered. As the cargo unit is always the same—the stem, or bunch—it will be seen that this cash register system affords a very quick and easy system of tallying any loss or fraud.

Green fruit alone is shipped to any distance from the steamer port. There are always some ripe bananas in the cargo, and these, together with the bunches of green fruit which are rejected because of defect in size, or in the number of fruit on the stem, are sold to local dealers or consigned to short-haul points. The capacity of the larger vessels of the company, one of which is shown in the accompanying illustration, is from 25,000 to 30,000 stems, equivalent to some 2,750,000 bananas. The capacity of the smaller vessels, constituting the majority of the fleet, ranges in the neighborhood of 18,000 stems.



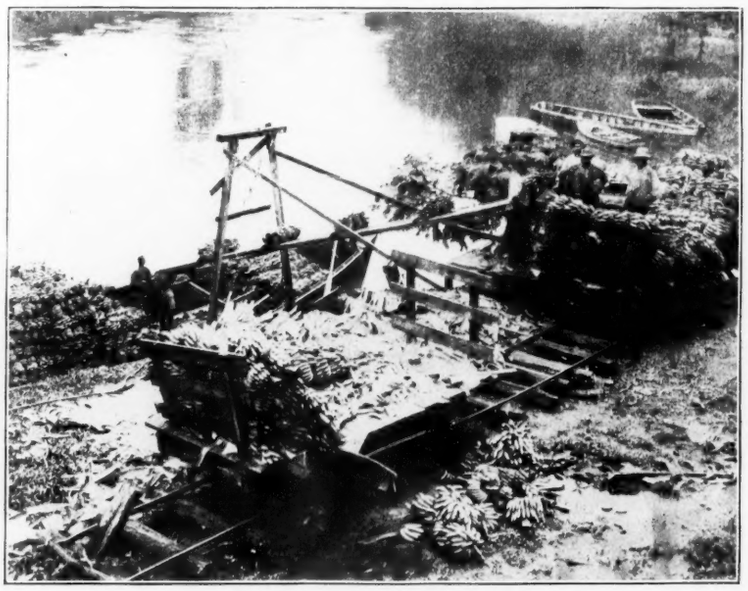
Route Map, Fruit Despatch Co. (United Fruit Co.).

The report last issued, that for the year ending September 30, 1903, showed that the company owned an improved plantation acreage of 92,523 acres and an unimproved acreage of 172,996 acres, giving a total acreage of 265,519. The largest holdings are in Costa Rica, where 108,902 acres are owned, of which 32,060 are improved. In Cuba 75,761 acres are owned, and the aggregate holdings in Jamaica, Santo Domingo, and the Republic of Colombia amount to over 80,000 acres, besides which 500 acres of improved plantation land were owned in Honduras. The company has recently been increasing its holding of sugar-cane plantations in Cuba, and now owns some 10,000 acres, in addition to some considerable acreage of cocoanuts and oranges, but the center and heart of the about what is required on one of the smaller vessels, and the bunches are handed up from the hold to a man standing on the 'tween decks, and so on to the deck, and on the car or truck. Since the first of July the fruit has been sold by the hundredweight. Prior to that time it was sold by the bunch; the bunches, or stems, being classified according to the number of "hands" of bananas they contained. Most of the fruit which commands the best market price is on stems of eight hands, each hand containing about 12 bananas, so that a bunch consists of from 90 to 100 bananas, and weighs some 45 or 50 lbs. With the quality of the fruit the same, the full-sized bunches of eight or nine hands command a higher price than the smaller bunches, per hundredweight.

Great care is taken in accounting the cargo, and each stem as it leaves the hold is tallied on a street car cash register of the familiar type. Besides this, bunches are

industry at present is the production and transportation of bananas. It has its own railroad facilities, in whole or in part, in each of the main territories where it works, amounting in 1900 to a total of 124 miles. The accompanying illustrations show the shipment of fruit by rail and by boat in Costa Rica. In addition to the American business, shipments of bananas and other tropical products have been made regularly by the company from the West Indies and Central America to England during the last year or so, and the results have been so satisfactory that three additional steamers are now being built especially for the European trade. The business is handled by a company organized under the laws of the United Kingdom, in which the United Fruit Company owns half the capital stock.

With the fruit landed at the dock, however, there still remains the problem of rail transportation, for it is imperative that the enormous traffic be handled without delays, with great care, and in a thoroughly systematic manner. A reproduction of the company's route map is shown with this article. The entire land business is handled by a subsidiary organization known as the Fruit Despatch Company, which was formed in December, 1898, to be the medium of distribution for the Boston Fruit Company. The main divisions of the Fruit Despatch organization are indicated on the route map by octagonal brass checks, which can be seen in the illustration. Each of these divisions controls several branch houses, indicated by the small, black stations on the map, and each branch house is in charge of a large number of agencies. On the actual route map, these agencies are marked by white thumb tacks with a number on the head, which classifies them according to the branch house to which they report, but the facsimile is so greatly reduced that they scarcely show.

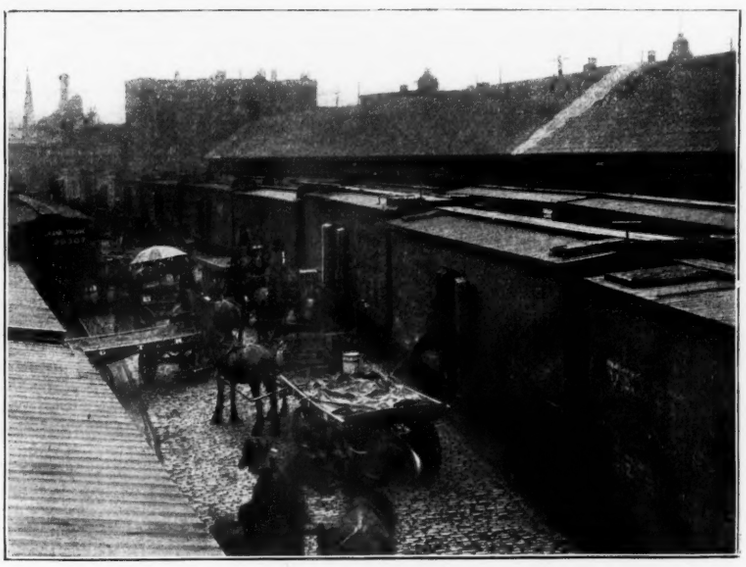


Loading Bananas at Cricamola, Costa Rica.

The lines on the map are strings of different colors, stretched to show the routes and the connections made for shipments to long-haul points over several lines of railroad. Thus, the way in which the fruit is sent from New Orleans to Denver is graphically indicated. In general terms, about half of the fruit is received at ports on the Gulf of Mexico and about half at ports on the Atlantic, and the division of territory is made according to this basis. Shipments to the New England States, to Montreal, to the greater part of Pennsylvania and Ohio, and as far south as Richmond, would commonly be made from New York, Philadelphia, Baltimore or Boston. Detroit, Cleveland and Columbus are on the borderland between the main eastern and southern divisions, and may receive shipments from either. But the territory east of this irregular boundary line is such a consumer of fruit that the business done in this section, geographically unequal, is approximately the same as that done by the company in all the rest of the country together. Shipments to the southern Atlantic cities can be more readily made from Norfolk or Charleston, but the entire West is served from New Orleans and Mobile. There are regular stations for the receipt of fruit as far away as Vancouver and Winnipeg, the time of shipment from New Orleans to these points being 15 or 16 days.

Banana Farm in Costa Rica.

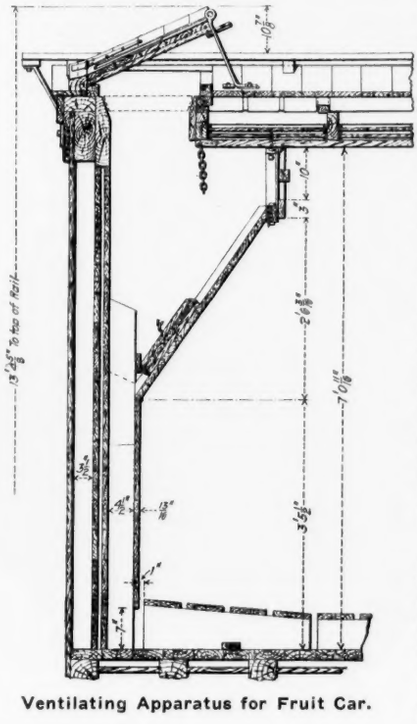
Free circulation of air is the only satisfactory agent for preserving the fruit in good condition en route during hot weather, and no ice is used. The drawing of the car built by the American Car & Foundry Co. specially for this traffic, for use on the New York Central, illustrates what has been found to be the best type of ventilation for the service. The air enters the rear end of the car by means of the roof ventilator, and is deflected under a grating, on which the fruit rests, to the forward end of the car. The ventilator on this end serves as an up-take and even a slight motion of the car creates a strong draft, which drives the cold air in underneath the fruit and removes the hot air on top. Whichever way the car is moving, forward or backward, the draft is of equal force, although changing its direction.



Solid Train of 15 Fruit Cars, New York to Montreal.

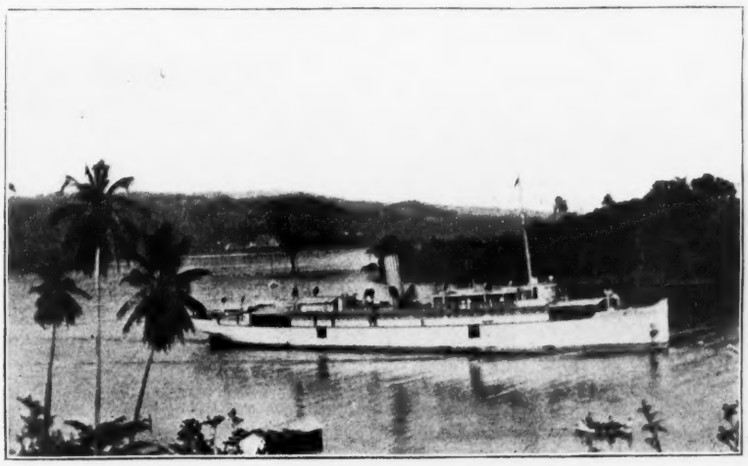
The Delaware, Lackawanna & Western also has some extremely satisfactory cars in service built especially for the trade, in which the ventilation works on the same plan, although the air chamber is of a different shape, and there are arrangements for carrying ice in case the cars are used for other kinds of produce. Out of Mobile and New Orleans the fruit is chiefly handled by the Fruit Growers' Express and by the refrigerator cars on the Southern Pacific. At times the shipments are made on special trains; otherwise on the regular fast freight service. The Illinois Central banana expresses, which run solid from New Orleans to Chicago in 33 hrs., when required, have been described in a previous issue of the *Railroad Gazette*, [August 28, 1903]. An insulated fruit house has been built on this line at Mounds, Ill., holding 80 cars, and another is now building at Springfield, Mo. The house at Mounds has a heater, but no cooling plant. The house at Springfield will have both. A special banana train of 15 cars, bound from New York to Montreal, is also illustrated herewith, and it is an interesting commentary on the growth of the business that a point so isolated should require so large a shipment at one time.

In loading the bananas on cars as they are taken from the ships, great care is taken to have them properly classified according to the number of hands on the stem. To provide for this, a flag is placed by the door of each fruit car, numbered 8, 7, etc., according as the car is to receive stems of 8 hands or 7 hands. In order to provide against the stupidity or ignorance of the gang of laborers who carry the fruit, each kind of flag is made a different color. One car commonly is marked with a yellow flag, bearing the letters "RIP" and a green flag bearing the letters "REJ." This indicates that this car is to receive the ripe fruit and also the broken or rejected bunches of green fruit, which, as previously stated, are classed together and sold to local jobbers. Each car is carefully weighed by the Fruit Despatch Company before it is sent out, and a card is placed on it giving the number of the car, the marked weight and the actual weight. As for example, car 6,706, marked weight, 42,000; actual weight, 41,900. This facilitates selling the fruit by the hundredweight in carload lots. A ventilated fruit car of the kind in common service contains about 450 bunches, which are laid in two layers, the lower one of stems standing on end and another one laid across on top of them. This leaves approximately half of the car free for the circulation of air on top of the fruit, and enables the bananas to be kept cool, while the hot air is thrown off the upper part of the car.



Ventilating Apparatus for Fruit Car.

Sales by the Fruit Despatch Co. during 1903, representing what might be called the gross operating earnings of the United Fruit Co., aggregated over $8,000,000, and the company disposed of nearly 25,000 carloads of tropical fruit.



Steamer Admiral Sampson Leaving Port Antonio, Jamaica.

Single Phase Electric Traction in Europe.

That long-distance heavy electric traction problems call for a system using high-tension alternating currents is now quite generally recognized. But the question whether three-phase or single-phase alternating currents are best suited for this purpose has not yet been definitely decided. The three-phase system has been successfully employed for a number of years on several European roads. But the modern demand is for a single-phase system on account of its alleged greater simplicity and greater efficiency of regulation. There are three completely worked out single-phase systems now on the market, the one of the Westinghouse Co., with a motor brought out by Lamme, the General Electric system with a motor originally designed by Eickemeyer and greatly perfected by Steinmetz, and the Finzi system, using the Finzi motor. The Finzi system has already been tried successfully on the street car lines of Milan, Italy, and the two American systems have been experimented with for some time past in the yards of the two manufacturing companies and are now being installed on different interurban electric railways in this country. We may thus expect to hear comparatively soon of the results obtained with them in regular service.

In the meantime Europe is going in for regular trunk-line work on a single-phase basis and a real competitive test between three-phase and single-phase systems is now being prepared there. The Societá Italiana per le Strade Ferrate Meridionali, already operating its well-known Valtellina Railroad by means of the three-phase system, has just decided to make extensive experiments with the Finzi single-phase system with a view to obtain results which would guide it in its future policy in regard to electric traction matters. The Valtellina Railroad is a normal gage line operated distinctly under steam railroad conditions and connecting Como with Lecco, Colico, Sondrio and Chiavenna in the northern part of Italy. For the last few years this road has been operated as a three-phase alternating current road. Its power station is situated in the Alps and generates 20,000 volts at 15 cycles per second. Twelve transformer substations distributed along the line reduce this tension to 3,000 volts, which is directly fed to the overhead contact line. The rolling stock consists of passenger motor cars and freight locomotives, both of the double-truck type and both equipped with one three-phase induction motor on each of the four driving axles. The passenger motor cars usually haul two or more trailers, and the locomotives are coupled to the ordinary freight trains in the manner customary on steam roads.

The administration of this road, naturally greatly interested in all electrical progress, has for some time been anxious to compare the merits of the three-phase and the single-phase systems, and it has now ordered a series of impartial tests, which will undoubtedly furnish a great amount of valuable information in this respect. After careful consideration of the merits of the various single-phase systems a Finzi single-phase equipment was ordered to be installed in one of the standard Valtellina motor cars, the equipment to consist of four single-phase alternating-current motors, each rated for a normal output of 100 h.-p. at 200-400 volts, together with the necessary controlling apparatus. The car is to be controlled electrically from either end, but no rheostat will be used, thus making the regulation very efficient. The current will be taken direct from the 3,000-volt overhead contact line by means of the standard type of Valtellina roller trolley. Each of the four motors will drive one of the four axles of the double-truck car by means of an intermediate gear. This car, as well as the three-phase cars now in use, will be called upon to haul a 100-ton train from Lecco to Sondrio at a speed up to 45 miles per hour. Further details regarding these tests are not at present available, but they will undoubtedly be watched carefully by all interested in electric traction matters. The Finzi system is represented in this country by Muralt & Co., of 25 Pine street, New York.

Accident Bulletin No. 11.*

The Interstate Commerce Commission has issued Bulletin No. 11, showing railroad accidents in the United States during the three months ending March 31, 1904. The number of persons killed in train accidents was 221, and of injured 2,797. Accidents of other kinds, including those sustained by employees while at work, and by passengers in getting on or off the cars, etc., bring the total number of casualties up to 919 killed and 12,444 injured. These reports deal only with (a) passengers and (b) employees on duty.

Table No. 1.—Summary of Casualties to Persons.

	Passengers.		Employees.	
	Killed.	Inj'd.	Killed.	Inj'd.
Collisions	33	661	99	1,006
Derailments	7	313	55	391
Miscellaneous train accidents (excluding the above), including locomotive boiler explosions	..	21	27	405
Total train accidents	40	995	181	1,802
Coupling or uncoupling	..	...	70	857
While doing other work about trains or while attending switches	..	...	65	2,826
Coming in contact with overhead bridges, structures outside of track, etc.	..	2	37	317
Falling from cars or engines or while getting on or off	25	295	143	2,453
Other causes	14	298	344	2,599
Total (other than train accidents)	39	595	659	9,052
Total all classes	79	1,590	840	10,854

The most prominent items in the foregoing table show a gratifying falling off, both from the figures of the preceding quarter (Bulletin No. 10) and from those of this quarter a year ago (Bulletin No. 7), though, of course, it is only in making such a comparison that any gratification can be found in a record of deaths averaging 10 persons a day. The number of employees killed by falling off cars, etc. (143), is 32 per cent. less than the record in Bulletin No. 10. This, very likely, may be due to the increased use of air-brakes on freight trains, diminishing the necessity for the men in charge of such trains to ride on the tops of box cars. The diminution in the figures as a whole is made in spite of a record of passengers killed in one class—collisions—which is large. Of the 33 fatalities in this class, 18 are chargeable to one collision (No. 18 in Class A).

Of the total in the table below, 294 collisions and 144 derailments affected passenger trains.

Table No. 2.—Collisions and Derailments.

	Number.	Damage to Road and Equip.	Kill.	Inj.
Collisions, rear	526	$536,056	40	527
Collisions, butting	217	390,213	56	546
Collisions, trains separating	238	102,038	1	96
Collisions, miscellaneous	678	334,506	35	498
Totals	1,659	$1,362,813	132	1,667
Derailments:				
Defects of roadway	222	$172,900	11	217
Defects of equipment	530	411,625	10	124
Negligence	74	80,423	9	66
Unforeseen obstruction	93	82,148	15	110
Malicious obstruction	9	11,964	..	23
Mis. causes	212	134,604	17	164
Total	1,140	$893,664	62	704
Total col. and derail.	2,799	$2,256,477	194	2,371

In collision No. 18, shown in the double column table, 18 passengers were killed. The circumstances of this case are typical of those features of train management which give rise to the charge, often repeated in various public prints, that American railroad management is reckless. The men in charge of the passenger train in this case had positive written orders to look out for (and meet) a freight train, with an engine of a certain number, at a certain place. This order was delivered to and read by both the conductor and the engineman. The freight train had not reached the appointed meeting place, and the only thing to be done by the men in charge of the passenger train—the regular and usual thing—was to stop their train and wait until the freight train should arrive. But another freight train was there on the side track, and it was *assumed* that that was the one specified in the meeting order. The conductor, apparently, made no effort to identify the freight engine, trusting that his engineman would do so; and the engineman, evidently, was willing to take the risk of passing on (at full speed, no stop being required at that station for leaving or taking passengers), knowing that if his assumption proved wrong he would in all probability cause much damage to property, if not great loss of life. In point of fact, he caused both.

The other cases in the list which are most prominent, on account of being fatal to passengers, are collisions 15 and 20. The last named appears to have been occasioned by the very severe weather which prevailed in January. Two other accidents, both costly, were due, in part, to the unusually low temperature which was so widespread in that month—collision No. 13 and derailment No.

*The *Railroad Gazette* train accident record for January, February and March will be found in the issues of February 26, March 25 and April 29.

CAUSES OF TWENTY-SIX PROMINENT TRAIN ACCIDENTS (CLASS A.).

[NOTE.—R. stands for rear collision; B., butting collision; M., miscellaneous collisions; D., derailment; P., passenger train; F., freight and miscellaneous trains.]

COLLISIONS.

No.	Class.	Kind.	Kill'd.	Inj'd.	Damage to Road and Equip.	Record. No.	Cause.
1	B	F. and F...	0	3	$2,300	59	Despatcher (experienced and with good record) overlooked orders; his age 32 years.
2	B	F. and F...	1	0	2,400	55	Engineman (who was killed) fell asleep 3 or 4 minutes before reaching meeting point.
3	B	F. and F...	0	16	3,160	15	Sixteen employees, who were injured, were riding in caboose, which was the leading car of a work train moving westward; engineman of eastbound passenger train misread name of station in order.
4	B	P. and F...	0	6	3,600	54	Wrong signal given; back wire of signal had been frozen and was disconnected; front wire probably pinned down by a piece of iron dropped from a train.
5	B	F. and F...	0	4	3,900	40	Butting collision of extra freight trains; despatcher failed to make meeting point; his experience 13 months as despatcher, 12 years as operator.
6	B	P. and P...	0	14	4,941	52	Conductor neglected to deliver meeting order to engineman.
7	B	F. and F...	0	3	5,000	14	Operator, 8 months' experience, failed to deliver order.
8	B	F. and F...	1	0	5,900	41	Flagman, who had been ordered to hold one of the trains, went into caboose to get red light; sat down to warm himself and dry his clothes; fell asleep; had been on duty 16½ hours.
9	B	P. and F...	1	2	7,298	11	Engineman and fireman of empty engine misread telegraphic order; engineman in handing order to fireman told him what it read, but did not tell him correctly; order read "2d No. 1;" these men read it No. 1.
10	B	F. and F...	1	8	7,400	57	Operator failed to notify southbound train that a northbound train, first section, had brought to that point signals for a second section.
11	B	F. and F...	2	1	8,730	60	Operator signed conductor's name to order, but then failed to deliver it; expected conductor to come into office for clearance card, but conductor neglected this duty; both experienced men.
12	R	P. and P...	0	11	10,242	2	Collision within yard limits; foggy; failure to flag.
13	R	F. and F...	0	4	10,400	7	Air-brakes frozen and would not work; conductor and brakeman in caboose did not hear whistle signal for hand-brakes.
14	B	P. and P...	2	8	12,526	33	Misplaced switch (10 p. m.); brakeman, for some unaccountable reason, turned switch in face of train.
15	M	P and F...	3	3	14,500	30	Passenger train ran past station; in setting back, ran over a switch, which had meantime been turned, and crushed caboose of freight train on side track; 3 passengers in caboose killed; freight brakeman, in charge of switch, 22 years old; on duty 14 hours 58 minutes.
16	B	P. and F...	5	8	17,100	53	Engineman of northbound train neglected to examine register, and so was ignorant of non-arrival of southbound train; proceeded and collided with it at 30 miles an hour. Engineman depended on conductor to check southbound train, but conductor failed to check correctly.
17	B	P. and F...	0	9	19,000	13	Northbound passenger ordered to wait for 4 southbound freights; waited only for 3; operator also at fault for clearing signal.
18	B	P. and F...	18	37	26,500	3	Occurred 1 a. m.; passenger train passed a meeting station without stopping; conductor and engineman did not correctly identify freight met at station.
19	M	P..... ...	0	11	27,180	61	Passenger train entered siding at night at high speed; misplaced switch; some evidence that it had been maliciously misplaced.
20	R	P. and P...	4	9	29,400	1	Foremost train standing at water tank; second train following too closely; furious snowstorm and wind, and very low temperature.
		Total.....	38	157	211,477	..	

DERAILMENTS.

1	D	P.....	0	7	$10,300	29	Unknown.
2	D	F.....	0	0	10,400	65	Broken wheel.
3	D	F.....	0	0	11,500	24	On 1½ per cent. grade; air-brakes failed; extremely cold weather; packing leather in air-brake cylinders frozen, allowing air to leak out; engineman, 3½ years' experience, failed to call for hand-brakes in season.
4	D	F.....	0	0	11,901	48	Broken flange; wheel cast-iron, 33 inches, 600 lbs., made in 1893; chill was too deep and wheel was not bored true.
5	D	P.....	0	0	14,121	44	Track distorted by solar heat.
6	D	P.....	0	0	23,260	49	Misplaced switch; wreck burned by fire starting in oil which ran out of the tender.
		Total.....	0	7	$81,482	..	
Total col. and derail...			38	164	$292,559	..	

3. A brake failure due to freezing of packing leather has never before appeared in these records.

Misconduct or negligence of telegraph operators is given as the chief or principal cause of 4 collisions costing $40,130 in damage to cars and engines and the loss of 3 lives. These are Nos. 7, 10, 11, and 17. One operator failed to deliver an order; one failed to give an oral notice, or notice by flag or signal, and one signed a conductor's name to an order without having been authorized to do so; and in the fourth case, although the conductor and engineman were primarily to blame, the wrongful clearing of a train-order signal by the operator was the final act which made the collision possible. Two collisions, Nos. 1 and 5, were due to mistakes of despatchers—and despatchers are presumed to be men who have made good records as operators.

Collision No. 9 is notable as being the fourth case recorded recently as due to precisely the same error in reading a written order—the overlooking of "2d," or "Second." Two such cases appeared in Bulletin No. 8, and a third in Bulletin No. 9. This would seem to point, obviously, to the need of a change in the scheme of numbering or naming trains, or in writing the numbers or names in despatchers' orders. Collision No. 3 was also due to misreading, no explanation being given except that the name which was written and the name which the reader assumed both begin with "St."

The Mexican Central Shops at Aguascalientes.

A preliminary description of these shops, with a general plan of the proposed layout of the yard and buildings, was printed in the *Railroad Gazette*, April 6, 1900. The plant has been completed and in operation for some time now. The following description has been sent us by Mr. C. T. Bayless, Mechanical Engineer of the road, through the courtesy of Mr. Ben Johnson, Superintendent of Machinery:

The consolidation of the Mexico City and San Luis Potosi shops of the Mexican Central into one general repair shop at Aguascalientes has practically been accomplished, and the headquarters of the mechanical department have been moved from Mexico City to the latter place. Aguascalientes, being at the junction of the Mexico and San Luis divisions, is the ideal location for a general shop and a center for material distribution to the entire system. The two old shops had been found insufficient to handle the repairs incident to a greatly increased equipment, and their consolidation has been brought about for the purpose of securing a better economy, together with increased facilities and greater capacity. Very few new machine tools have been purchased, but a much larger output from the old ones has been secured by their judicious arrangement and the provision of better facilities for handling the work.

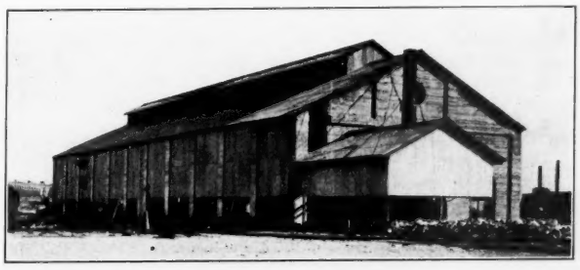
LIST OF TOOLS IN HAMMER AND SMITH SHOP.

Tool No.	Description.	Method of Driving.	Motor No.		H.-P. of Motor.
		INDIVIDUAL MOTORS.			
140.	No. 9 Sturtevant blower	Motor belted to a. c. s.	55		20
142.	Axle cut-off and centering lathe	Motor belted to a. c. s.	56	M. V.	5
143.	Double punch and shear	Motor geared to machine	54		20
145.	Buildozer	Motor belted to a. c. s.	53		20
158.	No. 7 Sturtevant blower	Motor belted to a. c. s.	62		10
		GROUP DRIVEN.			
		Group "A."			
134.	4-ft. grindstone	Motor belted to lineshaft "A"	61		5
135.	36-in. drill press				
289.	18-in. shaper				
		Group "B."			
136.	Switch and frog planer	Motor belted to lineshaft "B"	59		15
117.	Switch and frog planer				
		Group "C."			
146.	Bolt header	Motor belted to lineshaft "C"	91		20
150.	Washer machine				
151.	Bolt headers				
152.	Nut tapper				
		Group "D."			
155.	Upsetting machine	Motor belted to lineshaft "D"	52		20
157.	Rivet machine				
1.	3-in. bolt cutter				
	Total electrical horse-power in this shop				135

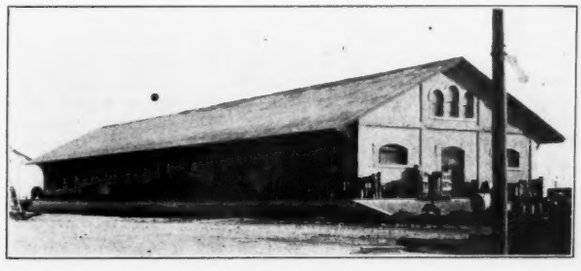
The design and construction of the buildings has been under the care of Mr. Lewis Kingman, Chief Engineer, and Mr. H. Bentele, Assistant Chief Engineer. Mr. Ben Johnson, Superintendent of Machinery, assisted by the writer and Mr. R. M. Henderson, Electrical Engineer, has had complete charge of the design and installation of the power plant and the equipment of the shops. The actual work of installation of the power house machinery and cranes, and the wiring for power distribution was done by contract by the D'Olier Engineering Company, Philadelphia, under the supervision of the mechanical department of the railroad.

General Plan.—The general plan of the yard and buildings is shown in the accompanying illustration, in which all buildings actually completed are shown by full lines, while future buildings and additions to the present ones are shown dotted. To the north of the shop yard is the yard of the timber preserving plant for treating cross ties, bridge timbers and telegraph poles by the Wellhouse or the zinc-chloride-glue-tannin process. Both of these yards are enclosed by a 10-ft. adobe wall with stone foundation, brick pilasters and brick coping. The adobe is plastered and whitewashed, giving the appearance of stone. These walls are necessary to prevent thieving, which is one of the greatest sources of loss to the railroads in Mexico. Outside and to the west of the shop yard is the general freight yard, water tanks, cinder pits and coal chute, as Aguascalientes is both a freight and passenger division terminal. To the east and south of the yard are the company cottages for employees and the general hospital of the system, where the headquarters of the Chief Surgeon, Dr. H. S. Squires, are located.

The buildings for locomotive repairs, viz.: machine, boiler and erecting shop, hammer and smith shop (and in the future a tank shop), are grouped together with the roundhouse and oil house at the south end of the yard. The car repair buildings, consisting of a truck, wheel and axle shop, planing mill and coach shop are grouped at the north end, while the material buildings, consisting of iron and brass foundries, rolling mill and storehouse, are in the center. Owing to the mild and equable climate such material as boiler and tank steel, iron castings, couplers, wheels, tires, etc., are stored in the material yard not under cover. The storehouse proper is reserved for small articles and such material as is easily perishable or liable to be stolen. The power house is located with reference to the center of power distribution, and cables strung on iron poles carry the current to the different buildings. All the water for the shops, hospital and company houses is supplied at present by two dug wells, one outside the wall near the office building, and the other at the timber treating plant. Water from the shop well is pumped up into a 100,000-gal. steel tank and that from the timber plant well into a 33,000-gal. tank. Both tanks connect with the water main, which also runs off northeasterly to a reservoir of about 350,000,000-gal. capacity, which it is hoped will be filled during the rainy season that lasts from about June to October.



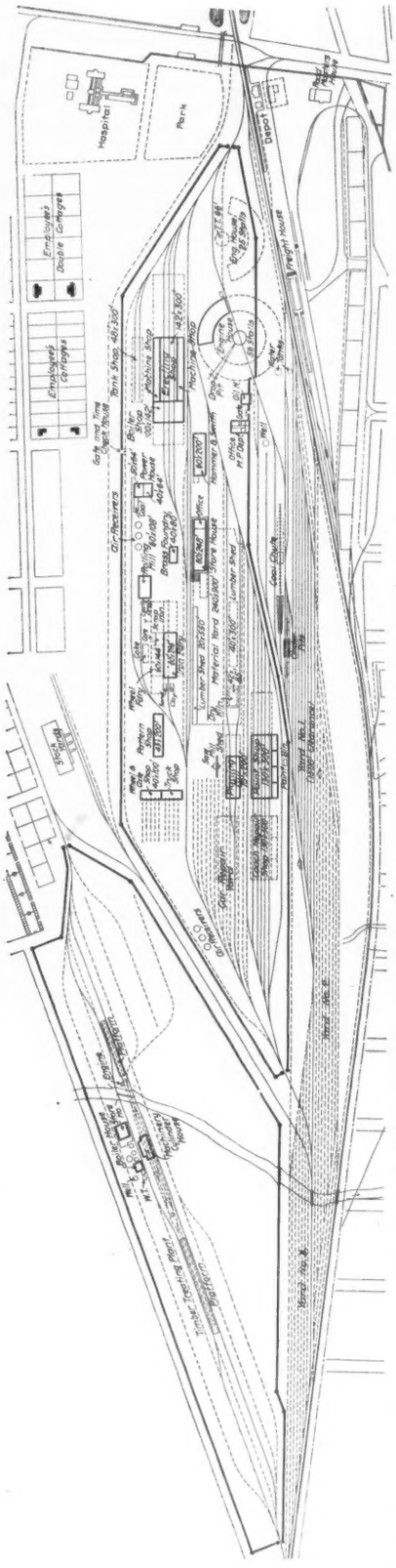
Hammer and Smith Shop.



Material Storehouse.

Hammer and Smith Shop.—The hammer and smith shop, located near the north end of the machine erecting and boiler shop, is 63 ft. wide by 201 ft. long. The rolling mill, iron foundry and planing mill are similar. The end walls and side columns are of concrete, roof trusses are of yellow pine, and side walls and roof are of galvanized corrugated iron. The side walls are open for a height of 6 ft. 9 in. above the ground and the corrugated iron sheets are fastened to old rails, the ends of which are set into the columns. The floor is dirt, tamped hard. In the extreme south end the frogs and switches for the entire system are made. For this purpose two double-head planers, a shaper and drill press are employed. The rails are heated in the furnace and cut or bent under the hammer so that only a finishing cut is necessary on the planers, thus saving considerable time overdoing all the work on the planers. Under the 6,000-lb. steam hammer, near the other end of the

building, are forged all the axles for the system, and such forgings as are too heavy for the 1,500-lb. hammer. A large bulldozer, double punch and shear, bolt headers and an upsetting machine complete the equipment at the north end.



General Layout of the Mexican Central Shops at Aguascalientes.

The table on page 217 gives a list of the electrically operated tools and the sizes of motors used:

Brass Foundry.—The brass foundry is 80 ft. by 40 ft., closed in from floor to eaves and provided with a large number of windows for lighting. Ventilation is accomplished by an ordinary roof ventilator extending the full length of the building. This building is closed in at the sides for the sole purpose of preventing theft. The roof trusses are yellow pine, and the roof galvanized iron. There are six Morgan brass furnaces for melting brass in crucibles. Blast for these furnaces is supplied by a No. 7 Buffalo blower driven by a 5-h.p. motor, No. 75, and the furnaces are served by a steel jib crane. Two furnaces are also provided for melting lead and babbitt, and one Tabor pneumatic molding machine for making journal bearings. In one corner of the building a 10-h.p. motor, No. 76, runs a magnetic separator, a small rattler, a double emery grinder and a journal bearing boring machine.

All brass castings, battery zincs, babbitt and solder for the system are made here and all cast-iron journal bearing shells are fitted with brass crowns and lined with babbitt. As before stated, these are for freight service. The total power used in this shop is 15-h.p.

Iron Foundry.—The iron foundry is 216 ft. by 60 ft., with a "lean-to" on the east side to form charging platforms for cupolas, and a core house. The building is the same construction as the hammer and smith shop. The core house is 42 ft. wide by 54 ft. long and contains in addition to the necessary benches two core ovens, one of which is 18 ft. by 24 ft., with a push car track for handling large cores, and the other 60 in. wide by 24 ft. long for small cores. This latter oven has a cast-iron front in six sections, each of which has two 10½ in. by 30 in. doors and four 6⅜ in. x 30 in. doors. To each of these doors is riveted a light cast-iron shelf in the form of a quarter circle with a sheet iron back so that when the shelf is pulled out the back closes the door opening and prevents escape of heat. All the iron castings used on the system are made in this foundry and the average run is about 10 tons of castings per day.

The foundry is furnished with a 10-ton Colliau cupola for general use, and an old 5-ton McKenzie cupola for emergency. The blast for the Colliau cupola is furnished by a No. 8 Sturtevant blower and for the McKenzie cupola by a McKenzie blower. Both are driven from a short shaft by a 20-h.p. motor, No. 22, arranged so that by shifting a belt either can be put into operation. The charging platform is served by an electric elevator made by Darien & Co. The motor driving this is located in the blower room and is a 10-h.p. motor, No. 77.

At the north end of the building a 20-h.p. motor, No. 66, drives a shaft to which are belted a grinder for sand, clay, etc., two emery grinders and two castings rattlers. The foundry is also equipped with three pneumatic Tabor molding machines for making brake shoes and other small work.

The total electric horse power in the shop is 50-h.p.

Rolling Mill.—This building is of the same construction as the iron foundry, is 60 ft. by 108 ft., and contains a 9 in. three-high train of rolls driven by a vertical engine, two heating furnaces with locomotive boilers above them to furnish steam for the engine, and a 2,500-lb. steam hammer. These rolls are used to roll scrap iron into round and flat bar iron, it first being hammered into billets under the steam hammer. The experience of this road has been that a much better grade of iron can be secured by hammering the billets than by rolling them.

A 10-h.p. motor, No. 16, drives a No. 6 Sturtevant blower to furnish blast for the furnaces and a 10-h.p. motor, No. 84, is geared to a large No. 10 Robinson-Rhae Manufacturing Co. alligator shear located near the cooling beds, and used to cut the bar iron.

The total electric horse power in this shop is 20 h.p.

Pattern Shop.—The pattern shop is 43 ft. by 200 ft., made of adobe with brick pilasters, and brick trimmings around doors and windows. The adobe is plastered both inside and outside, the former being given a smooth finish and the latter a rough one, lined to imitate stone. At the south end of the building for 60 ft. is the work-room where the patterns are made, and the remainder of the building is divided into seven pattern storerooms by firewalls which extend up through the roof and isolate the storerooms. Each of these rooms is provided with two windows on the east side closed by shutters which are sheathed with galvanized iron and a door on the west side similarly sheathed. These storerooms are also provided with shelving for storage of patterns.

In the work-room a 10-h.p. motor, No. 79, drives a pattern-makers' lathe, a core-box machine, small band saw, surfacer, rip saw and grindstone. An electric heater for the glue pot is also provided.

Truck, Wheel and Axle Shop.—This at present is a temporary structure built of wooden posts and trusses, with galvanized iron sides and roof. It was moved to Aguascalientes from Mexico City and will be replaced by a building of the same construction as the rolling mill and hammer and smith shop. It is 40 ft. wide and 200 ft. long and will be used exclusively for the truck, wheel and axle work for coaches and freight cars. Small forgings for car repair work will also be made there, and a compressed air line is brought into the shop for riveting machines, hoists, and machines for the manufacture of brake-beams.

The following table gives a list of the electrically driven tools, and sizes of motors used:

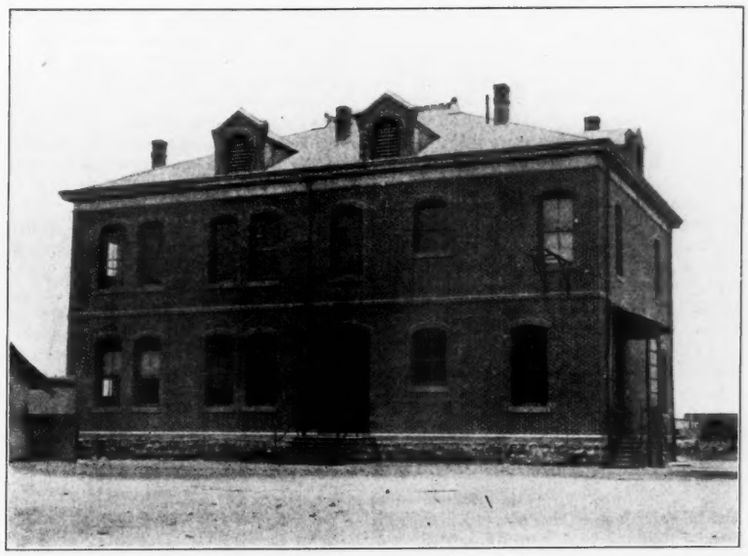
Tool No.	Description.	Method of Driving.	Motor No.	H.-P. of Motor.
171.	No. 7 Buffalo blower	Motor belted to blower	69	5
		Group "A."		
170.	40-in. drill press	Motor belted to short lineshaft	71	10
282.	27-in. drill press			
169.	27-in. drill press			
139.	Spring hammer			
		Group "B."		
188.	Car wheel borer	Motor belted to short lineshaft	60	5
	Emery grinder			
288.	Bolt cutter			
		Group "C."		
181.	Hydraulic wheel press	Motor belted to short lineshaft	72	5
182.	Hydraulic wheel press			
		Group "D."		
112.	Axle lathe	Motor belted to short lineshaft	70	10
183.	Axle lathe			
178.	Car wheel lathe			
291.	Pipe cutter			
	Total electric horse power in shop			35

Planing Mill.—This building also is of the same design and construction as the hammer and smith shop except that it has skylights in the roof made of heavy ribbed glass. It is 70 ft. by 200 ft. and has two tracks longitudinally through the building. These connect at the north end with the yard tracks, and at the south end will be extended to pass on each side of the dry kiln when that is built. The floor is vitrified brick laid on edge on a layer of sand as in the machine shop and the motors are placed on supports located against the columns of the building.

To the east of this mill is a small saw mill consisting of a 44 in. circular saw and common log carriage. This saw is driven by a 30-h.p. motor, No. 50, belted directly to the pulley on the saw arbor.

All the lumber for extensive car repairs as well as for the construction of new cars at this point is handled in this mill, and car lumber is dressed and finished for shipment to outside points which are not provided with facilities for doing this. On a handle machine are made all the axe, pick, hammer and other handles used on the road.

The following table gives a list of the electrically driven tools and sizes of motors used:



Mechanical Department Headquarters Building.

Tool No.	Description.	Method of Driving.	Motor No.	H.-P. of Motor.
212.	Dimension planer	Motor belted to planer	49	15
219.	Cross-cut saw	Motor belted to saw	51	15
	Group "A."			
204.	Handle machine	Motor belted to lineshaft	42	15
199.	Knife grinder			
203.	Wet emery grinder			
202.	Saw grinder			
200.	Bench emery wheel			
201.	Bench emery wheel			
	Group "B."			
273.	Rip saw with iron table	Motor belted to lineshaft	45	20
205.	Rip saw with iron table			
	Group "C."			
285.	Surfacer	Motor belted to lineshaft	46	20
284.	Rip saw with iron table			
	Group "D."			
213.	Surfacer	Motor belted to lineshaft	47	30
214.	Frieze and edge moulder			
215.	Jig saw			
216.	Combination saw and dado machine			
218.	Universal wood worker			
287.	Mortiser			
	Group "E."			
209.	Jointer	Motor belted to lineshaft	43	15
220.	Car sill tenoner			
222.	Borer and mortiser			
	Group "F."			
223.	Small borer and mortiser	Motor belted to lineshaft	48	15
224.	Sticker			
225.	Small tenoner			
286.	Band saw			
274.	Band saw			
227.	Wood lathe			
228.	Grindstone			
	Total electric horse power, including saw			175

Storehouse.—The storehouse (Fig. 2) not only serves as a local store for material used in these shops, but also as a general distributing store for the entire system for all departments. As before stated, all of the bulky material that is not harmed by exposure to the mild climate of this place is kept outside in the storehouse yard, while in the house is stored the more valuable perishable stock. At the south end of the building are offices for the local storekeeper and also for the material agent of the system, who makes his headquarters here. On both sides of the building are 8-ft. loading platforms, the edges of which are made by setting four old rails in cement. The four rails are held together by a cast-iron clamp, the two outer ones being set with base of rail up and the two center ones with head up. The cast-iron clamp keeps them from spreading and the spaces between them are filled with cement. The edge of the platform being thus formed by the base of the rail, never chips or breaks off, and wears indefinitely. It is the practice of this road to make the edges of all station platforms in a like manner. On each side of the storehouse is a standard gage track and material is handled to the shops on push cars. All "job orders" for the road are handled through the storehouse and after completion in the shops are shipped to destination.

Office Building.—The office building containing the headquarters of the mechanical department is a very neat two-story red brick building, shown in Fig. 23. The first floor is arranged with offices for the superintendent of machinery, superintendent of shops, mechanical and electrical engineers, drafting room, and shop paymaster, while the second floor is occupied by the chief clerk of mechanical department, with the exception of a blue-print room in the southeast corner. Fireproof vaults are furnished to the drafting room, paymaster and chief clerk. The roof and cornices of the building are of galvanized iron, while the window ledges are of concrete. The interior of the building is very neatly finished in yellow pine and varnished.

The power house, machine, erecting, boiler and paint shops and engine terminal facilities will be illustrated and described in subsequent issues of the *Railroad Gazette.*

A New Speed Record on the Atlantic City Road.

On Wednesday, July 20, train No. 25, of the Atlantic City Railroad, was run from Camden, N. J., to Atlantic City, 55.5 miles, in 43 minutes, equal to 77.4 miles an hour. The record on the train despatcher's sheet shows that this train ran from Winslow Junction to Meadow Tower, 29.3 miles, in 20 minutes, or at a rate of 87.9 miles an hour. The regular engine of the train was disabled, so that the start was made several minutes late, with engine 334; but the train reached Atlantic City three minutes ahead of time. Besides the engine, there were in the train one combination car, three passenger cars and one parlor car. The times at Winslow Junction and at Meadow Tower are recorded in even minutes, so that the rate of speed is probably subject to some slight correction. Accounts have been printed headed "115 miles an hour," referring to the speeds for short distances, but these, for the reason indicated, are of doubtful accuracy. The best previous record that we find over this line is that of August 5, 1898, when the run through was made in 44 minutes 45 seconds (74.4 miles an hour); but in that case there were six cars. On August 20, 1898, a train of seven cars was run through in 46 minutes 45 seconds.

A writer in the *Journal* of the German railroad gives a long and elaborate analysis of the cost of passenger traffic on the Saxon State railroads, the result of which is that he finds it to be something like 5 per cent. more than the passenger earnings. Travel by express trains yields some profit (because express trains run only where there is considerable travel), and perhaps ordinary passenger traffic on main lines; but this profit does not equal the loss on branch lines. The Saxon fares are very much lower than ours; but doubtless a similar result would be shown on many systems here. Mr. Fink's elaborate studies of the cost of transportation on different parts of the Louisville & Nashville, made 30 years ago, showed how costly transportation is on some branch lines, and the average passenger train load of 46, in this country, indicates that on the average there is little profit in passenger traffic.

The Glenwood Collision.

The coroner's jury, at Chicago, which investigated the rear collision on the Chicago & Eastern Illinois, at Glenwood, on July 13, when 18 passengers were killed, has returned a verdict recommending that the conductor, one brakeman, the engineman and the fireman of the freight train be held for trial before the Grand Jury; and that the train despatcher, F. O. Whiteman, be also held, on the ground that he was criminally negligent in omitting to give orders, which he might have given, to prevent the collision. The verdict also censures the railroad company for using old and dilapidated cars and for requiring freight trainmen to work too many hours. The reports contain no evidence to warrant the censure of the despatcher and none concerning the quality or condition of the cars; and the only statement that we have seen concerning hours is to the effect that the freight fireman had been on duty 17 hours.

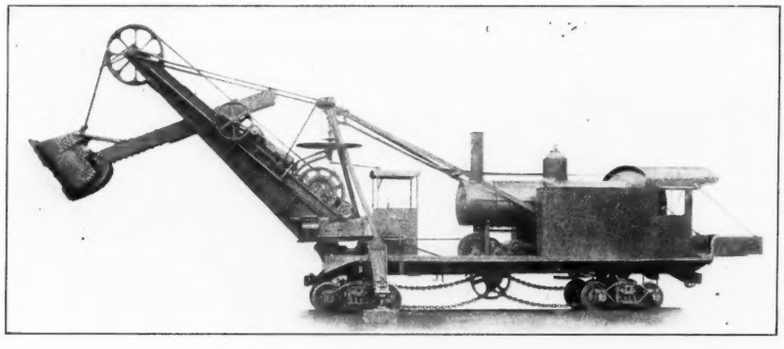
The evidence given at the inquest indicates that Engineman Hoxie, of the freight, is the principal person at fault, and he has disappeared. The testimony of the other trainmen at the inquest throws no light on the reasons for Hoxie's misconduct.

The report of the collision given in the *Railroad Gazette* of July 22, page 179, is substantially confirmed. The conductor of the freight, Frank Cooper, alighted from the front portion of his train (engine and 30 cars) as soon as it reached Thornton, and it appears that while he was in the station office the engineman backed the cars southward. When Cooper came out he said to the station agent: "What is that fool engineer trying to do with that train?" He and the agent then went back into the office to telegraph to Glenwood to order Hoxie back to Thornton. Brakeman Charles H. Wright was on the leading car of the string of cars as Hoxie pushed them southward. The intention of the conductor was to have the cars backed from the east (northbound) track across the southbound track, to a siding still further west, the crossover being south of the entrance to the siding, so that it was necessary to set the cars back southward and then pull them north in order to enter the siding; but Hoxie continued backing southward. Conductor Cooper says that the engineman disregarded three signals given by him, and Brakeman Wright also says that he tried to stop Hoxie; but the facts concerning these hand-motion signals and about Cooper's going north to flag are not clearly reported. By the time the cars had reached Glenwood the train despatcher had been advised of what was going on; and although Operator Smoot, at Glenwood, was off duty, he came into the office and the despatcher gave him an order to stop the cars which were coming from Thornton. To do this, Operator Smoot ran out and climbed a car and told Brakeman Wrignt to stop, as the passenger train was coming on that track; Smoot then jumped off, waited until the engine reached him and then notified the engineman. Smoot returned to the office to advise the despatcher; and on coming out, a moment afterward, found the train stopped and Hoxie and Wright disputing about the responsibility for having run the cars to Glenwood. They had talked only a minute or two when the collision occurred.

One or two interesting points were brought out which, while not bearing directly on the main cause of the collision, show how collateral circumstances frequently have a vital bearing in cases of this kind. Brakeman Wright admitted that if he had remained on top of the leading car he probably could have given a signal which could have been seen from the engine of the passenger train in time to prevent the collision. On the other hand, it looks as though the engineman of the passenger train was not keeping a good lookout. He did not see the freight cars until he got within 300 ft. to 500 ft. of them; but the line curved to the left and he, no doubt, could have seen much farther if he had looked across the top of his boiler. One statement is to the effect that the fireman could have seen 1,700 ft. ahead, but he says that he was blinded by the glare of the fire-box. Without suggesting any suspicion of this particular fireman, railroad men will at once be reminded of the frequency with which they have heard this explanation given by a fireman who simply was not taking an interest in the lookout. The testimony of the men in the baggage car indicates that the conductor came into that car and gave the stop signal, on the whistle cord, before the engineman had shut off steam or applied brakes. The conductor, after pulling the cord, immediately jumped off.

The Atlantic Steam Shovel.

The accompanying illustration shows a new design of steam shovel which is being sold by the Atlantic Equipment Co., New York. It was designed by A. W. Robinson, and is built by the American Locomotive Company. In quality of workmanship it is fully up to standard practice for locomotive construc-



The Atlantic Steam Shovel.

tion, and while it has a number of radical departures from the usual form of shovels it still retains the best features of the older designs. In actual service it has proved to be a machine of great speed, power and capacity. The shovel shown is now in use on the New York Central and is designated as Class 38-16-2½, that is, a shovel having a pull on the dipper of 38,000 lbs., a clear height of lift of 16 ft. and dipper of 2½ cubic yards capacity.

The distinguishing feature of this shovel is the direct wire-rope hoist. In the chain hoist the friction loss is often as high as 40 per cent., while in a direct wire-rope hoist the friction loss is less than 10 per cent. A single sheave of large diameter is used for hoisting, which besides reducing friction, also increases the angle of lead of the bucket. A heavy pull on the bucket by the hoisting chain has little effect other than to strain the machine if the angle formed by the chains and the dipper handle is acute. In this shovel the angle is increased to such an extent that the digging effect is practically doubled. The whole arrangement of boom and dipper gives a high lift to the bucket; as compared with other shovels with the same length of boom, about 4 ft. to 6 ft. more lift can be obtained. Machines of this type can be built with a clear lift of 20 ft., which will work at as high speeds as the old type of shovels with a low lift. The hoisting engines are incorporated in the base of the boom so that the whole hoisting machinery revolves together. The hoisting machinery is compact and at the same time strong and easy of access. The drum is short and of large diameter and fits between the sides of the boom which constitute the frame. The gearing is steel and the hoisting friction is quick and sensitive, doing its work without heating. It is operated by steam so that the operator exerts no effort.

The A frame is formed of solid steel bars, having solid forged pin connections at the feet and a cast steel head. It is stepped upon the ends of the jack-arm truss in such a way that it forms a continuation of the jack-arms, giving additional stability and relieving the car frame from strains. The A frame head is arranged so that the three strains intersect in a point, thus doing away with all lateral bending strains.

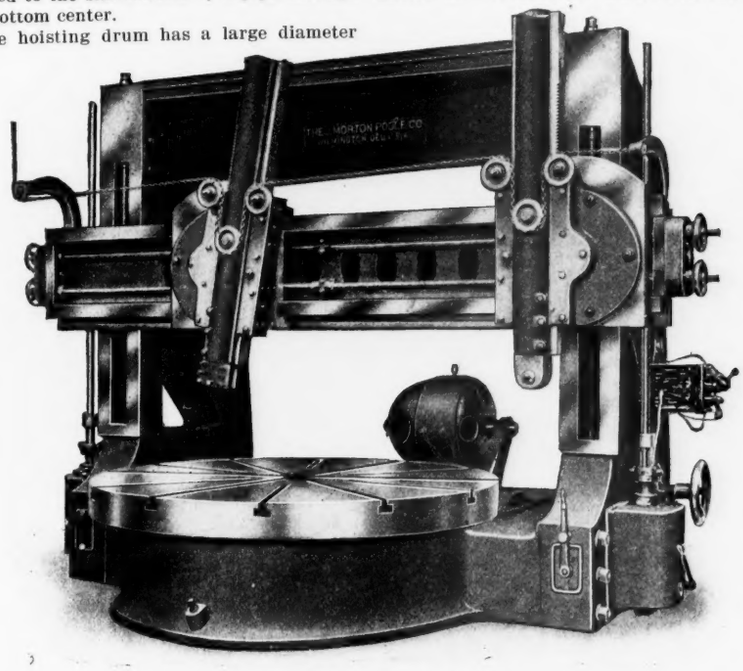
When required the A frame can be lowered for transportation over the road to 15 ft. (or lower) above the rail. The pin-connections at foot of the frame permit of this movement and the back guys are shifted forward to a connection provided for the purpose. The raising and lowering of the A frame is done by power.

The boom is a departure from the usual practice, being made with a straight taper deepest at the inner end. This form is simple and gives the greatest strength where it is needed and the least weight at the outer end where there is greatest motion. The most severe strains in a boom are those due to twisting when swinging rapidly and in irregular work caused by the leverage of the dipper handle. To give the lower flange of the boom strength in a horizontal or lateral direction the upper members of the boom are made of steel channels set vertically and the lower members are made of channels set horizontally, while the web is a solid steel plate. The turntable is built solid with the boom, being made of stiffened steel plates and a rolled rim. The hoisting machinery is mounted directly upon the boom so that no guide sheaves are necessary, and the power is applied directly with the least possible loss. A pair of engines with drum and gearing are mounted on the base of the boom. They take up very little room and can pull the required amount on the dipper at a speed of five to six dipper loads per minute. All of the parts are adequate for continuous heavy work and are easily accessible. The frame of the engines is cast steel in one piece and forms the foot of the boom and center of the turntable as well. The engines and gearing are located on the axis of rotation of the boom and therefore do not appreciably increase the power required for swinging nor interfere with the speed.

The main engines are of the locomotive

type, with outside cylinders and are enclosed in a sheet steel casing for protection. They have a solid cast steel frame for both engines cast in one piece, and steel cross-heads. All parts are easy of access. Steam is carried by a pipe having a double ball and socket joint on the top center, and the exhaust is carried to the smokestack by a pipe through the bottom center.

The hoisting drum has a large diameter and is grooved for steel wire rope. There are two parallel ropes, each bearing half the load, equalized around a small sheave or thimble at the dipper. The two ends of the rope are tied by clips at the drum and are attached in such a way that the rope can be removed and replaced without delay. The cost of renewal of a steel rope 1½ in. in diameter and 108 ft. long is about $40. An equivalent chain would be 1⅜ in. and 125 ft. long and would cost about $134. The rope will last fully as long as the chain, since there is but one sheave over which it runs and there is the added advantage that a rope will give warning of weakness due to wear before it breaks, while a chain snaps without warning. The hoisting drum is driven by two steel gears and two band friction clutches operated by steam, and the clutch and throttle are controlled from the runner's stand on the car.



The Poole 10-ft. Boring Mill.*

Instead of attaching the double hoisting rope to a bail and sheave it is attached directly to the back of the dipper in such a way that the lines of force meet in a point situated in the plane of the resistance or in line with the strain applied to the teeth. The entire back of the dipper is one piece of cast steel with lugs formed upon it to receive the dipper-arm, hinges for door, etc. The lip and teeth of the dipper are amply strong and are attached so as to be easily renewable.

Independent thrusting engines are used to feed the dipper to its work. These engines are solidly built with bed plate cast in one piece and securely bolted to the boom. The gearing is steel and the engines are reversing by means of a central valve. They are completely enclosed and have no rocker arms, valve spindles, etc., exposed in any way so as to be injured by flying fragments from blasting.

Independent reversible engines are employed for swinging being duplicates of those on the boom for thrusting. They are double-geared to a drum which carries double steel wire ropes on each side, which are connected to the turntable. The shovel is propelled by the swinging engines, power being transmitted to a cross shaft underneath the car. This shaft is connected with the forward and rear axles by two chains of sufficient strength to slip the wheels. The swinging and propelling shafts are all short and strong and are attached to the main center sills of the car.

The boiler is of the locomotive type and is made large enough for engines of twice the cylinder capacity of those used. It is built to carry 140 lbs. pressure and is lagged with magnesia and planished iron. All of the other parts of the machine are either housed in casings or built to stand exposure. With the exception of a steel cab for the fireman and a shelter for the craneman, the usual box covering has been omitted, and this gives the shovel a peculiar appearance. If it were necessary the whole machine could of course be enclosed.

The shovel is mounted on diamond arch-bar trucks of extra heavy design and hand brakes are applied to the rear truck. Large water tanks are supplied and a hinged coal platform on the back end carries the coal supply. This is made of steel and when not in use it folds up against the back of the cab.

One of these shovels at work on the New York Central frequently loads ten cars (100 cubic yards) in eight minutes. Another machine is now at work on the terminal site of the Pennsylvania in New York and one is also on exhibition at St. Louis by the American Locomotive Company.

*This illustration should have appeared as Fig. 1 in last week's issue, instead of the illustration which was shown.

Railroad Shop Tools.

(*Continued.*)

BORING MILLS.

The 54-in. car wheel boring mill shown in Fig. 1 is made by William Sellers & Company, Philadelphia, Pa. The table has a self-closing and self-centering chuck, which will take wheels up to 42 in. in diameter. The table is 54 in. in diameter and can be started or stopped instantly by lever, without moving the belt shifter. The feed is operated by friction discs with automatic hold-fast. The crane is stopped automatically at the upper and lower limits of its travel. All the hoisting mechanism is placed on the outside of the machine and is easily accessible. A slide rest is provided for facing the wheel hubs. A boring bar 3½ in. in diameter, fitted with a set of double cutters which give four cutting surfaces, is furnished with each machine. The countershaft has two sets of fast and loose pulleys, one set 24 in. x 4 in. and the other set 18 in. x 6 in. These should run at 134 r.p.m. and 290 r.p.m., respectively.

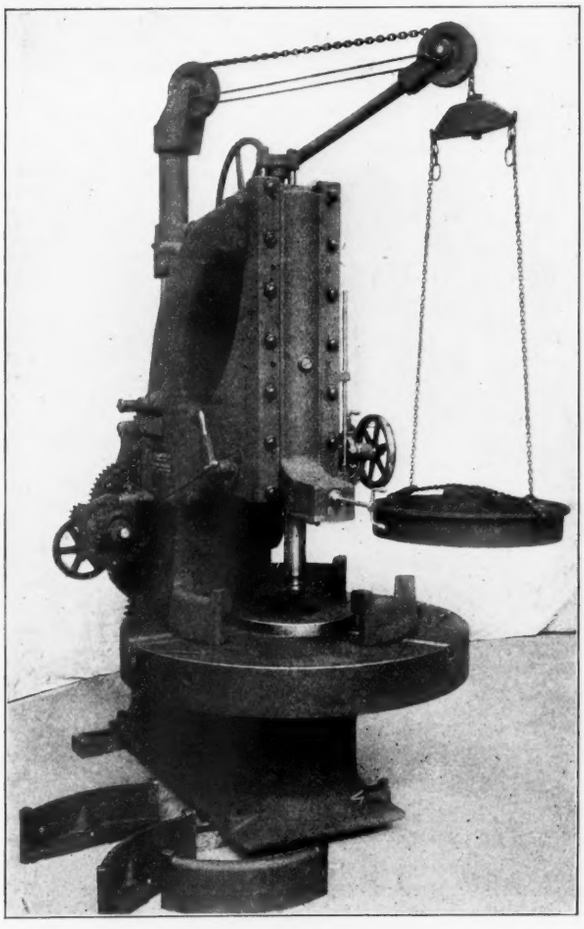


Fig. 1—The Sellers 54-in. Wheel Boring Mill.

The 52-in. vertical boring and turning mill shown in Fig. 2 is made by the Rogers Machine Tool Company, Alfred, New York. This machine will take work 52 in. in diameter and 40 in. high. The table is 50 in. in diameter and has sixteen ⅞-in. T slots.

The table can be stopped at any desired position by a foot brake. The spindle has a V-shaped lateral bearing, 35¼ in. in diameter. The housings are 88 in. high and 37 in. wide at the bottom; they are the box type and have a 6¾-in. bearing on the cross rail. They are fastened to the base by bolts and keys. The cross rail is the box type and is 91¾ in. long and 17¾ in. wide. It is 6 in. thick and has an 18⅞-in. bearing on each housing. It is fitted with a belt lift, applied to the center of the lift shaft and transmitted equally to each screw. The counterbalance weight lifts on the cross rail, instead of the rail carrying the weight. The heads are independent in regard to amount and direction of the feeds. Either may be brought to the center for boring, or they may be run tandem. The feeds are positive geared, and are separated by levers. There are 12 changes, ranging from 1/36 in. to ¾ in. horizontally and 1/54 in. to ½ in. vertically, per revolution of the table. The saddles are 18 in. wide, and have a bearing of 2¼ in. on the top and bottom of the cross rail. The cross rail has a 17¾-in. face, and the swivels have 21⅞ in. bearing on the tool stakes. The swivels are graduated and can be set at any angle. The tool stakes are 41½ in. long and 7¼ in. wide. They have a travel of 27 in., and are fitted with clamps to grip the toolholders. The toolholders are forged from machine steel and are 15 in. long and 3 in. in diameter. The driving mechanism is placed between the housings. It is direct geared and has 24 changes of speed, ranging from 1.04 to 52.47 r.p.m. of table. It is supplied with a friction clutch for locking the drive gear. The driving gear is independent of the table. The racks and gears in the heads are steel. The worm wheels are bronze. The countershaft should run at 220 r.p.m. and has a friction clutch pulley mounted on a shaft 2¼ in. in diameter, running in ring oiling bearings. The floor space required for this mill is 106 in. wide by 108½ in. long. The weight of this machine is about 19,000 lbs.

The 37-in. boring and turning mill, Fig. 3, is made by the Niles-Bement-Pond Company, New York City. This mill will swing work 37 in. in diameter and the tool bars have a traverse of 18 in. The boring bars are steel forgings octagonal in section, having four sides scraped to bearings in the swings. Clamp screws are provided in the lower boxes.

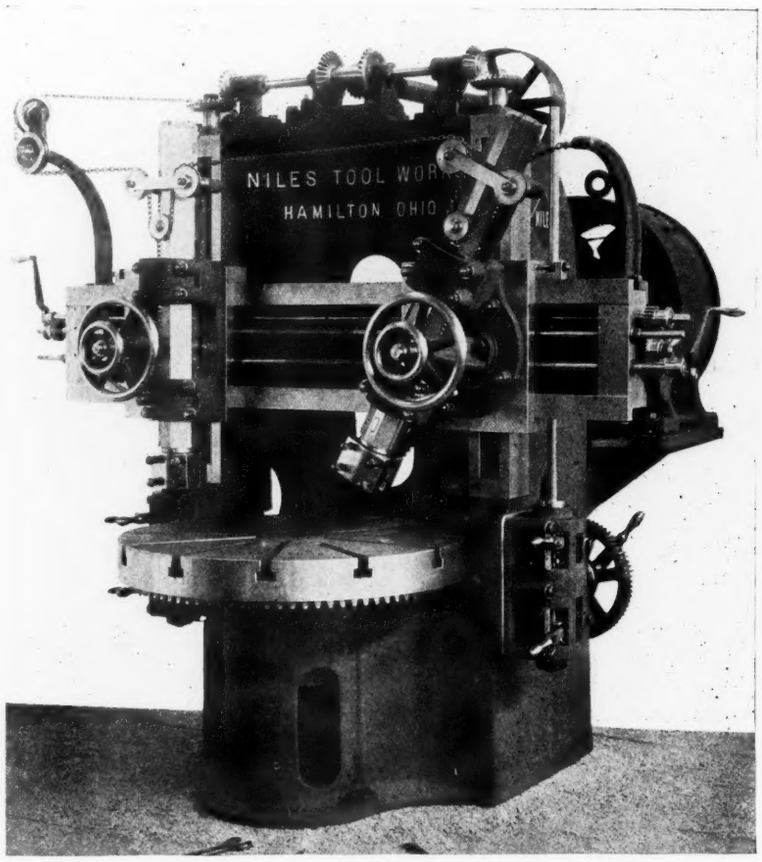


Fig. 3—The Niles-Bement-Pond 37-in. Boring and Turbine Mill.

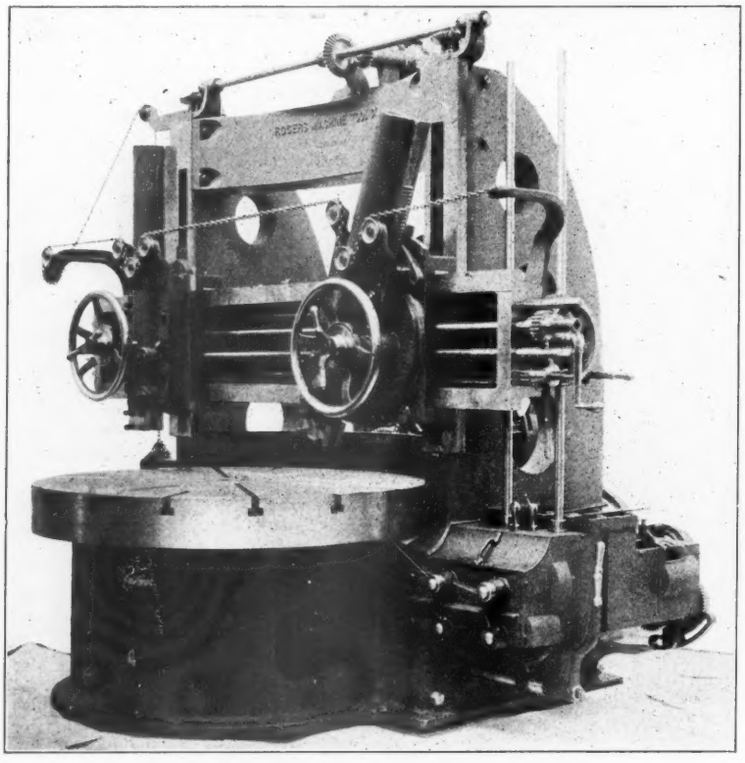


Fig. 2.—The Rogers 52-in. Boring and Turning Mill.

The toolholders are solid steel forgings keyed into the bars by taper-sockets. They are readily removed for the insertion of double-end cutter-bars or other tools. The heads can be set to any angle. Only one counterweight is used. This is half the weight of one bar and acts in a line with the bar at all angles. This does not tend to pull the swing over or interfere with easy movement of the saddles along the rail. The cross rail has a power elevating gear and is of the box-girder form made double between the housings. The table is driven by cut bevel gearing; the table spindle has a taper-bush at the top for taking up wear. The lower step runs in oil. The feeds are positive driven by gearing. The feeds for the heads are independent and reversed or changed from a fine to a coarse feed by levers at each side of the mill. There are eight changes of feed, four for roughing and four for finishing. All the changes of a given set are obtained by sliding gears at the ends of the cross rail. The bed, housings, back and top brace of this mill are cast in one solid piece. No part of the machine extends below the floor. The motor for driving the mill is a 5-h.p. Westinghouse Type S., designed for the three-wire system, using 110 to 220 volts, and it has a speed variation from 310 to 1,240 r.p.m.

The 60-in. boring and turning mill shown in Fig. 4 is also made by the Niles-Bement-Pond Company. This machine will take work 60 in. in diameter and 36 in. high. The diameter of the table is 54 in. and the tool bars have a traverse of 30 in. The rim of the table runs in an annular grove cut in the

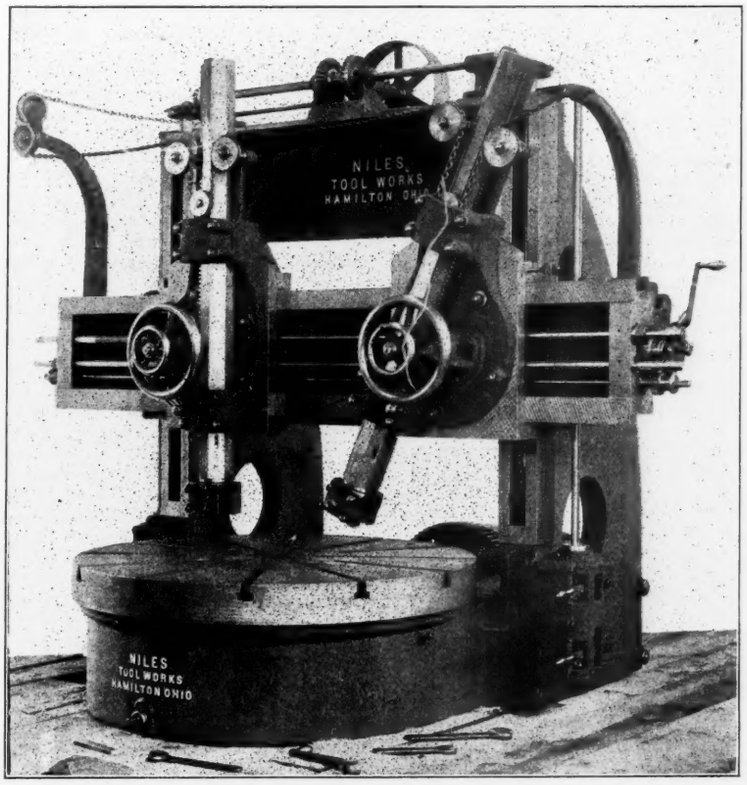


Fig. 4.—The Niles-Bement-Pond 60-in. Boring and Turning Mill.

bed and flooded with oil. The table spindle has a taper bush at the top for taking up the wear. The lower step runs in oil and rests on a wedge, which has a screw adjustment for slightly raising the table from the annular bearing when running at high speeds.

(To be continued.)

Costs and Profits of Electric Railways in Germany.*

The enforced publication of corporate finances and the exhaustive methods by which municipal accounts are kept and made public in Germany have enabled the Association of Electrical Engineers to collect and formulate some highly interesting statistics on the financial results which have followed the change from horse to electrical traction in street railways in this country. Although this transformation began later here than in Belgium and the United States, it was made with such promptness and energy that within a period of four or five years the horse car practically disappeared from Germany and was replaced by electrical tramway systems, which traverse all the cities and larger towns and connect each of them with practically every village and hamlet in a large and constantly extending radius. These systems have now been in operation long enough to supply some definite data as to the profits of such enterprises under existing conditions in Germany, which, measured by average street railway dividends and the market values of their shares, have been in general somewhat disappointing. The net fact, which has been known to investors for some time, and which these newly formulated statistics confirm and explain, is that electric street-car lines, while serving the public infinitely better than any other method of city and suburban transportation yet devised, have proved in many if not most cases less lucrative to shareholders than the horse-car lines which they replaced.

There are several tangible reasons for this, some of which are more or less peculiar to Germany. Among these may be cited the fact that most German municipalities refused at the outset to permit overhead conductors to be used in important or centrally located streets, and the companies were therefore forced to use a costly type of car which would take its current in the suburban streets from an overhead wire carrying a voltage sufficient to charge at the same time storage batteries of sufficient capacity to run the car through the central districts where the trolley wire was forbidden. These storage batteries were heavy and expensive, they deteriorated steadily and were difficult to keep in order, and when the snow and ice of winter encumbered the tracks they failed so utterly in Berlin, Hanover, and other cities that thousands of cars equipped with them had to be thrown out and their storage batteries removed. It was only at this heavy cost that the overhead trolley wire secured admission to the central districts of several German cities, and there are even yet in Berlin and elsewhere long stretches on important avenues where it is tabooed and underground conductors are insisted upon as indispensable.

A second important fact in this connection is that German municipalities are very exacting with tramway companies in respect to rates of fare, paving, and all the other specifications of their franchises. Every step in the process of construction is subject to the inspection and control of the city engineers. Most franchises involve the responsibility of the company of laying and keeping in repair the pavement on all space between the two outer rails, a breadth, in case of double tracks, of 12 to 15 ft. or more, and where, as in Berlin, the pavement is asphalt laid on deep foundations of rubble and cement, this becomes a heavy item in the cost of construction and maintenance, for no skill and experience seem able to avert the necessity of frequent upheavals for purposes of repair, in which asphalt and cement have to be cut out with cold chisels driven by sledges, a slow and toilsome operation.

Moreover, there are very few municipalities in Germany where electric current can be generated by any other or cheaper power than that of steam or gas engines, and no form of steam fuel is really cheap in this country. Although a very few of the largest central stations produce electric power as low as 1¼ cents per kilowatt-hour, in most others the cost averages from 2¼ to 3¾ cents, and in certain small stations as high as 10 cents per kilowatt-hour. Estimated by the ordinary German standard, the power consumption per car varies with grade, curves, and other conditions from 450 to 700 watt-hours per car-kilometer, equal (in case of the latter figure) to 1,170 watt-hours per car-mile.

Finally, the outlay for track renewal and repair turns out here, as elsewhere, to be unexpectedly heavy. In the days of horse cars a well-laid track in a city of from 150,000 to 200,000 inhabitants would last from a dozen to fifteen years. Now, with the far heavier and more frequent cars, the rails, especially at curves, wear in much less than half that period until the wheel flanges are found running on the bottom of the groove, so that the track has to be taken up and renewed. Another cause of frequent and expensive repairs lay in the fact that the surface resistance of the copper bonds with which the rail ends were united increased rapidly under certain conditions, until their use was largely superseded by the better system of welding the rail joints by means of electrical heat or thermite.

Still another increased item of expense has been that of labor. The motormen are naturally employees of a higher grade than horse-car drivers, and being well organized, they have been able to compel increased wages and to shorten working hours until the net labor cost per car-kilometer is more than 50 per cent. greater than in former years.

To all this is to be added the fact that the rates of fare in most if not all German cities are rigidly restricted by the authority granting the concession. From the latest published statistics it appears that the average street railway fares paid in eleven principal German cities during the year 1903 varied from 2.2 cents each at Frankfort to 2.72 cents at Hamburg, the mean average for Berlin and its suburbs being 2.35 cents, or less than half the usual 5-cent fare that prevails generally in the United States. To complete the restrictions under which street railways operate in this country, most of their charters contain clauses providing that from a prescribed date the company shall pay to the municipality a portion of its surplus after disbursing a stipulated percentage as dividends. Many charters further provide that after being operated by the companies for a specified term of years the whole installation, tracks, power plant, and equipment, shall revert in fee simple to the municipality which has granted to the corporation for a term of years the use of its streets.

The total length of German street railways at the close of 1902 was 1,906 miles, of which 346 miles, or about 18 per cent., were under municipal ownership. Of the latter, 65 miles were leased to individuals, leaving 281 miles of lines operated directly by the municipalities. The four longest municipal lines are at Frankfort, 26½ miles; Düsseldorf, 25 miles; Munich, 29 miles, and Co-

*Government report from Consul-General Mason, Berlin, Germany.

logne, 40 miles. It does not appear that fares over these lines are lower, but, on the contrary, that they are rather higher than those charged on similar lines worked by individuals or corporations. On the whole, it cannot be said that experience has increased public sentiment in Germany in favor of municipal management of street railways, and several cities—among which is Barmen—which built their own lines are now considering the plan of leasing them to private companies.

By far the largest and most important corporation of this kind in Germany is the Great Berlin Street Railway Company, which, with its various branches, operates 200 miles of track, of which 144 miles are owned and the remainder are controlled by the company. On its own lines the "Grosse Berliner" ran last year 40,400,000 car-miles and carried 295,000,000 passengers, whose fares aggregated $7,025,000. The total capital of the company is 100,082,400 marks ($23,918,611); its shares are to-day worth 184, and its 3½ per cent. bonds are quoted at 99.40. This, however, is the status of an exceptionally powerful and ably managed company in a large, level city, and is quite above the average financial condition of street railway companies elsewhere in Germany, most of which have to be satisfied with 4 and 5 per cent. net earnings on their stock.

The one all-controlling fact which has enabled street railways in Berlin and other German cities to make head against the exacting requirements of municipalities and the enormous cost of conversion from horse to electric traction, with the increased outlay for labor, workmen's insurance, paving, and other expenditures, has been the phenomenal increase in business, particularly in the suburban traffic in all the larger towns, which has come with the increased speed, the greater frequency of service, the better ventilation, space, and comfort of electric cars. Whole suburbs have been built up within a few years by the influence of a single well-managed tramway line, which carries a legion of men and women to and from their daily toil in the city more quickly and cheaply than the horse car could transport them half the same distance. And although the electric street railways of Germany under the conditions above described are but moderately remunerative to shareholders, they hold a high place among the potent influences of modern civilization.

The Sturtevant Fuel Economizer.

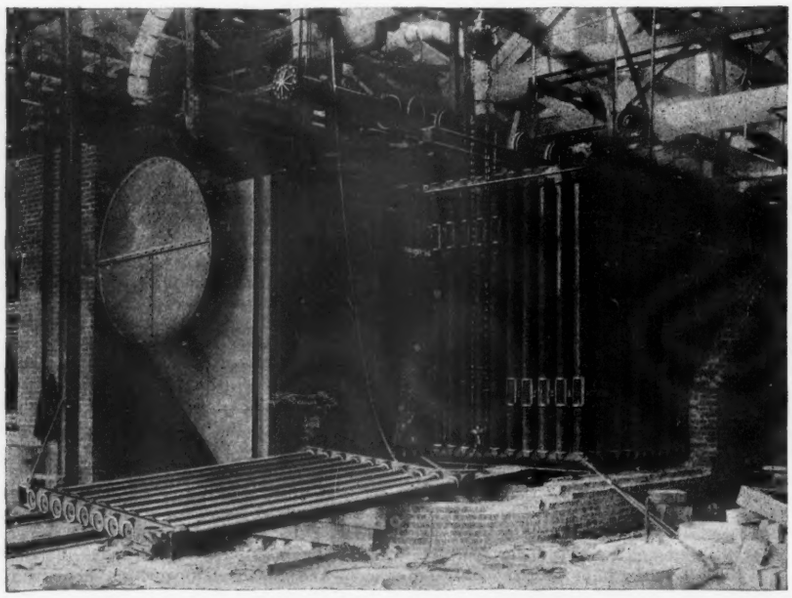
Two essential qualities of a fuel economizer are, the ability to utilize for heating water a maximum amount of heat (otherwise wasted) from the escaping gases, and the accessibility of all surfaces for cleaning, repairing and renewals. The Sturtevant "Standard" and "Pony" type economizers shown herewith were designed to utilize the waste heat from the gases by a patent system of staggered pipes. This system compels all the hot gases to encircle the pipes, thus giving much effective heating surface.

The joints of the Sturtevant economizer are made taper, metal to metal, and are designed so that any pipe can be taken out and a duplicate substituted without disturbing any other pipe, section or side walls. This would not be possible if packing, cement or rusting were used to make tight joints. Any header can be withdrawn and a duplicate substituted without disturbing any other header, section or side walls. Any section can be withdrawn and a duplicate replaced without disturbing any other section or side walls. There are no connection pipes to remove and all water surfaces are rendered accessible by the removal of the caps. The taper metal to metal joints make these economizers especially valuable for high pressures.

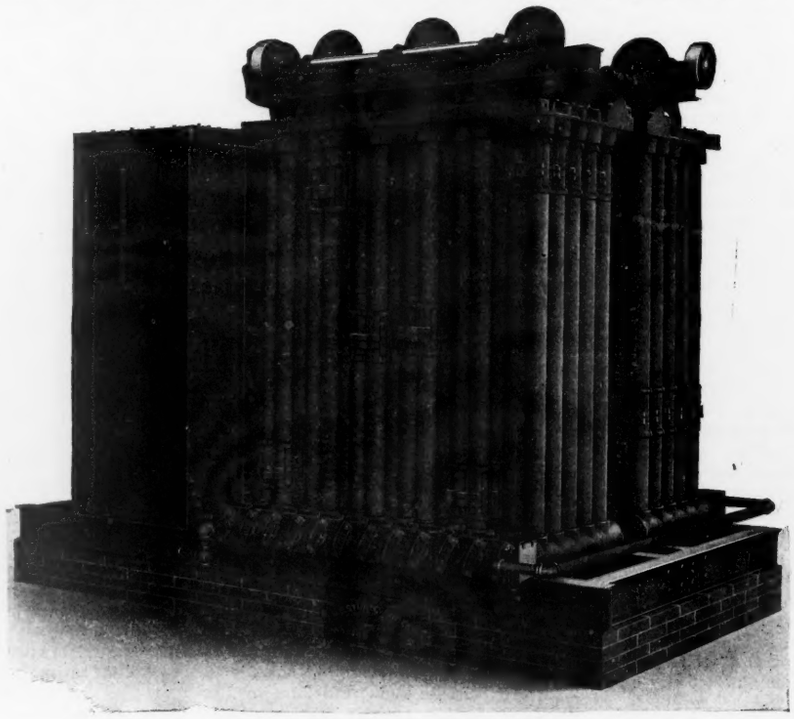
The scrapers are interchangeable and the driving mechanism is positive. A guide-plate for the scrapers is used which prevents them from sticking and breaking. The driving pulley can be belted up parallel or perpendicular to the length of the economizer. The economizers are not designed for forced circulation, but the connections are made in such a way that the flow of water is started in the proper direction, so that the flow up and down the consecutive sections will take place without making undue work for the pump. The machines are constructed so that the parts have the rigidity otherwise required in the foundations. The fact that taper metal to metal joints are used also eliminates the necessity of building more rigid foundations, as there are no gaskets to loosen and leak if the foundations spring slightly.

The "Standard" type is built in sections containing pipes from four to twelve wide, the staggered system of pipes making it possible to build sections of an odd as well as an even number of pipes. The "Standard" is adapted to power plants of almost any size, but is more commonly used for boiler capacities of 350 h.-p. and over. The "Pony" type is smaller than the "Standard" and is better adapted to power plants of 350 h.-p. or less. All machines are made of cast iron and are tested to 350 lbs. pressure.

These economizers are made by the B. F. Sturtevant Company, Hyde Park, Mass.



Sturtevant Standard Economizer with 1,500 H. P. Babcock and Wilcox Boiler.



The Sturtevant Pony Economizer.

GENERAL NEWS SECTION

THE SCRAP HEAP.

The Chicago & Eastern Illinois now runs its passenger trains into the La Salle Street Station, Chicago, and the passenger route to Dearborn Street Station has been abandoned.

Large numbers of men have been discharged from the Pullman Car shops at Pullman, Ill., during the past month in consequence of the falling off in work, and on August 1 it was announced that the shops were soon to be closed "indefinitely" for lack of orders.

It is reported that the Canadian Minister of Railways proposes to introduce in Parliament a proposition to establish a pension fund for the employees in the operating department of the Government railroads. It is not proposed to have the government contribute the whole of the fund.

It is reported from Schenectady that the General Electric Company intends to try the Fessenden wireless telegraph between the Schenectady and Lynn plants. The telegraphic and telephonic communication between these plants is almost constant during the busy hours of the day, from 200 to 300 messages passing between them daily by telegraph, while for telephone service the bills amount to more than $100 a day. Schenectady and Lynn are about 200 miles apart.

Between 100 and 200 cars of ice (coming from Lake Erie) were recently taken over the Louisville & Nashville from Cincinnati to Nashville, 301 miles, in ten hours. The ice was carried in refrigerator cars and in trains of about ten cars each. The time given is, we suppose, the average time of the several trains. From Nashville to Chattanooga, 151 miles, one of the trains was run in 4 hours 30 minutes. The ice was destined for Georgia, to be used in cooling refrigerator cars to be loaded with peaches for the North.

Press despatches from Texas last Monday announced that the telegraph operators of the Missouri, Kansas City & Texas had struck and left their offices, claiming that the company had failed to adjust differences concerning hours and wages which had been under consideration for several weeks. The officers of the road say that not over one-third of their stations (all small stations) are affected by the strike; that some new men have been secured and that if the strikers would refrain from tampering with the wires the existence of the strike would hardly be noticeable. It is said that telephone lines were used to some extent for sending train orders.

Contracts for Nickel-Steel Forgings.

The Navy Department has received bids from the Midvale Steel Co. and the Bethlehem Steel Co. for nickel-steel forgings for seventeen sets of 12-in., 45-caliber; one set of 10-in., 40-caliber. and twelve sets of 8-in., 45-caliber guns. The bids were the same from the two companies, 30 cents a lb., and the contract, amounting to about $1,000,000, will probably be divided between them.

The Panama Canal Commission.

Rear Admiral J. G. Walker, U. S. N., Chairman, and Commissioners Harrod, Grunsky, Burr and Judge Magoon, members, of the Panama Canal Commission, and Col. Biddle, Corps of Engineers, U. S. A., sailed from New York on July 26 for the Isthmus, where they will met Gov. Davis of the Canal Zone and Col. Hecker, who are already there. At present Admiral Walker is quoted as saying there are about 2,400 men at work. The sanitation of the strip is the main work at present and is progressing successfully.

Train Robbery Near Chicago.

On the night of August 1, about 10 o'clock, two sleeping cars in the southbound express train of the Illinois Central, which had just left Chicago, were robbed by four masked men, who subdued the porters and one brakeman, took the valuables of all the passengers in the two cars and then stopped the train and escaped just before reaching Matteson, 28 miles from Chicago. The first car attacked was the second from the rear of the train and the robbers appear to have entered from the day car next in front, soon after the train left Grand Crossing. They ordered the passengers who had retired to deposit their clothing containing valuables in the aisle of the car, intimidating some of them with pistols and striking one with a hatchet. Having gone through the first car, they drove the passengers with their belongings into the second (last) car. It is believed that the robbers are former railroad trainmen.

Gasolene and Kerosene Oil Distribution on the Alton.

On the first of the month the Chicago & Alton inaugurated a system of kerosene oil and gasolene distribution to stations which has done away with the shipment of small lots in cans and barrels from the principal storehouse at Bloomington. In the new system tank cars are used, the oil or gasolene being delivered directly from the car into tanks at the stations, large enough to hold a month's supply. Each station, interlocking tower, pumping plant and terminal is provided with these storage tanks, and the tank cars, which are attached to way freights, will replenish the stock every 30 days.

The estimated cost of installing the system, including the cost of the tanks, is $2,260. The estimated yearly saving is as follows:

On purchase of oil in tank lots, 2 cts. a gal.	$1,730
On loss from leakage from barrels	420
On loss and breakage of cans in shipment	250
	$2,400
Less per diem on tank cars	300
Net saving	$2,100

It is expected that the new system will prove much more satisfactory in every way than the old one.

P. R. R. Brakemen and Firemen.

It appears that a considerable portion of the agitation which has been reported in the newspapers concerning reduction of forces on the freight trains of the Pennsylvania Railroad has been due to the fact that on the long and hard runs of the Middle division the brakemen have assisted the firemen; and the readjustment of the conditions affecting this work has been the subject of a conference between the Superintendent of the division and a committee of firemen. Following this conference, Superintendent Preston issued the following order:

"As there seems to be a misunderstanding as to the assistance brakemen are expected to give firemen, effective this date, it will be the duty of the front brakeman to assist the firemen as follows: Eastbound, Ryde to Mifflin (28 miles); westbound, Lewistown Junction to Huntingdon (37 miles); and to shovel down coal from Spruce Creek to Tyrone Forge (six miles); to assist at all coal and water stations. Firemen will prepare and clean fires at Ryde."

The run from Harrisburg to Altoona is 132 miles, and it appears that several years ago, when the size of the locomotives was increased, an extra brakeman was put on, with the special purpose of relieving the fireman. Including this special man, called a "jackman," each train had a conductor, a flagman and three brakemen. Now, as we understand the reports, these trains have a conductor, a flagman and two brakemen; so that, in addition to the man at the front end, who helps the fireman, there would still be two men besides the conductor.

New Unloading Record on the Great Lakes.

The new steamer A. B. Wolvin has, as expected, broken all cargo records on the Great Lakes during the short time which she has been in commission this season. Her cargo record to date is as follows: Nine thousand nine hundred and four net tons, 1,800 lbs. soft coal Lorain to Duluth; 9,727 gross tons iron ore, Two Harbors to Buffalo; 10,569 net tons hard coal, Buffalo to Milwaukee; 10,973 gross tons iron ore, Escanaba to South Chicago; 9,945 gross tons iron ore, Duluth to Conneaut.

The Wolvin in her last trip to Conneaut established a new unloading record for ore. Her cargo of 9,945 gross tons was unloaded in 4 hours and 30 minutes by four Hulett clam-shell machines and four Brown electrical machines working together. The Wolvin arrived at Conneaut on Friday night, but was compelled to wait her turn until Monday morning. At 7.20 o'clock Monday morning the eight buckets began working upon her and at 11.52 o'clock the last bucket was hoisted from the hold and the whistle of the big steamer signaled for a tug. She had been completely unloaded without any hand labor whatever. No such work has ever been done before on the Great Lakes. The nearest approach to it is the record of the James H. Hoyt, when 5,200 tons of ore were taken from that steamer by the four Hulett machines in 3 hours and 52 minutes. The Hoyt, like the Wolvin, has her hatches spaced 12-ft. centers.

Manufacturing and Business.

B. E. D. Stafford, 3538 Lindell avenue, St. Louis, who has been the representative for the Ewald Iron Company in the Central West and Southeast, has resigned.

The American Blower Company has secured the order for the heating apparatus for the East Salamanca roundhouse and car repair shops of the Buffalo, Rochester & Pittsburg.

W. H. Armstrong, formerly manager of the New York business of the Chicago Pneumatic Tool Co., is now associated with the Ingersoll-Sergeant Drill Co. He will take charge of the pneumatic tool department.

The Steel Company of America has been incorporated in New Jersey, with an authorized capital stock of $3,000,000. The registered agent of the company is the New Jersey Guarantee & Trust Co., of Jersey City.

The United States Steel Corporation has bought the wire plant of the old Trenton

Iron Co., at Trenton, N. J. The outstanding capital of the latter company is $600,000. The American Steel & Wire Co. will operate the plant.

It has been announced that the Jones & Laughlin Steel Co., of Pittsburg, will spend about $1,000,000 in increasing its open-hearth steel capacity. Work has already been begun on four open-hearth steel furnaces which will have a yearly capacity of about 350,000 tons.

Announcement has been made that the recent fire at the plant of the Chester Steel Castings Co. was very small and has in no way curtailed the output of the company. The fire was confined to one furnace and the building immediately over it, and all departments are now again in operation.

The Bridge Operating Company, of Brooklyn, N. Y., has been incorporated at Albany with a capital of $100,000 to enter into contracts to operate the East river bridge. The directors are: E. W. Winter and C. D. Meneeley, of Brooklyn, and H. H. Vreeland, J. L. Wells, R. W. Meade and C. E. Warren, of Manhattan, New York City.

The stockholders of the Eastern Steel Co., of Pottsville, Pa., have voted to increase the capital stock from $5,700,000 to $9,400,000. Of this increase, $2,500,000 will be first preferred and $1,200,000 common stock. The money will be used to complete the new plant which the company is now building in Pottsville.

John F. Allen, 370 Gerard avenue, New York City, the maker of the Allen riveting machine, has made arrangements with Fenwick Freres & Co., 21 Rue Martel, to represent the Allen tools in France, Italy, Spain and Portugal and Belgium. Mr. Allen has also made arrangements with John Turnbull, Jr., & Sons, 190 West George street, Glasgow, Scotland, to handle the Allen riveters in Great Britain.

The Wyckoff Pipe & Creosoting Company, of Stamford, Conn., have the contract for furnishing the city of Baltimore, Md., with creosoted wood paving blocks to be used for paving in that city. These blocks are rectangular and are laid with close joints, thus preventing the fibers in the wood from spreading. When properly treated with dead oil or coal tar these blocks are impervious to water.

Judge Platt, of the United States Circuit Court, has handed down a decision that Herbert E. Keeler has not infringed the patent granted the Curtain Supply Co., May, 1896, for an improvement in pinch-handle curtain devices. The defendant maintained that when the claims of the complainant were properly construed there was no infringement, and the judge, finding that the patentee had only the object in mind of making a "self-righting" curtain fixture, that is, one capable of automaticaly returning to a horizontal position after careless handling had left it tilted or canted, sustained the defendant.

The Barker Mail Crane Company, Clinton, Iowa, has recently sold two cranes to the Lake Shore & Michigan Southern. A special design of crane was needed for use with four tracks, the cranes being placed between the tracks. The arms on the cranes need to be short, and as the Barker crane occupies little space when the arms are down, it met the conditions of service acceptably. The cranes were also built to turn from one track to the other, in case the mail trains should be run on the outside tracks. Also four cranes have been sold to the Illinois Central, after a year's trial of one. The Canadian Pacific, Big Four, St. Louis Southwestern, New York, Ontario & Western, and Bangor & Aroostook have also bought cranes. The C., M. & St. P., Union Pacific, M., K. & T., Tennessee Central and C. & N. W. have had some of the cranes in use from one to two years.

Judge H. H. Wheeler, of the United States Circuit Court, for the southern district of New York, has rendered a decision in favor of the Weston Electrical Instrument Company. This company brought suit against the Whitney Electrical Instrument Company for infringement of patent No. 392,387, granted to Edward Weston for an electrical measuring apparatus. The judge said, among other things, that, "the parts of the defendants' instrument look quite different from the corresponding parts of the instrument of the patent, but notwithstanding these differences in form they are there in the instrument and do the same things substantially the same way, and that if these changes of forms are even patentable improvements the defendants have taken and used the invention of the patent in making and using those improvements. These differences do not, any or all of them, amount to doing the same thing in different ways, but leave the operative parts doing the same thing in the same way."

Iron and Steel.

The Harriman Lines are said to have ordered 60,000 tons of steel rails at $28 a ton. Of this amount, 20,000 tons go to the Southern Pacific, 20,000 to the Houston & Texas Central and 10,000 each for the Union Pacific and the Oregon Short Line. These rails are all heavier than those which they are to replace.

PERSONAL.

—Mr. John Patterson Ramsey, who succeeds Mr. Gridley as General Manager of the Chicago, Peoria & St. Louis, was born in 1864 in Covington, Ky., and was educated in Pennsylvania. After filling various positions in the railroad service during school vacations he entered the regular service, on the Cincinnati, Hamilton & Dayton, as Assistant on the Engineering Corps. This was in 1885. The next year he was made Resident Engineer in charge of the Troy & Piqua cut-off, and in 1887 was appointed Supervisor of the Indianapolis Division, where he remained until 1890, when he was appointed General Roadmaster of the Fort Wayne, Cincinnati & Louisville. Then for a year he was on the Columbus, Hocking Valley & Toledo as Engineer of Maintenance of Way, and later he went to the Ohio Southern as Superintendent. In 1894 he left this road to go to the Chicago, Peoria & St. Louis and in 1895 took a position in the engineering department of the Peoria & Pekin Union. In 1896 Mr. Ramsey took a position as General Manager for the Sierre Madre Construction Company, a company which was organized to build 156 miles of railroad in Mexico. This work was completed in about a year and after the transfer of the property to the Rio Grande, Sierra Madre & Pacific, Mr. Ramsey continued as General Manager.

—Mr. M. L. Doherty, at one time General Manager of the Lehigh & Wabash Despatch at Detroit, Mich., died in that city on July 25, at the age of 74.

—Mr. J. H. Duggan, at one time Superintendent of the Chicago, Burlington & Quincy at Creston, Iowa, died on July 18, at Burlington, at the age of 52.

—Mr. Henry T. Nash, for many years Auditor of the St. Louis, Alton & Terre Haute, and at one time Treasurer of the New York & Ottawa, died suddenly in Seattle on July 28. Mr. Nash was born at Ravenna, Ohio, 66 years ago, and entered the service of the St. Louis, Alton & Terre Haute in 1873. Of late years Mr. Nash has been connected with the banking house of N. W. Harris & Company as a railroad accountant.

ELECTIONS AND APPOINTMENTS.

Atchison, Topeka & Santa Fe.—The titles of C. A. Morse, Acting Chief Engineer, and J. M. Meade, Assistant Engineer of the Eastern Grand Division have been changed to Assistant Chief Engineer and Engineer of the Eastern Grand Division, with offices at Topeka, Kan.
(See San Francisco & Northwestern.)

Atlantic Coast Line.—J. W. Oplinger, hitherto Master Mechanic, has been appointed Superintendent of Motive Power, with headquarters at Savannah, Ga., succeeding W. H. Young, resigned.

Canadian Pacific.—Charles H. Bowers has been appointed Assistant Master Car Builder of the lines east of Port Arthur. Peter McPherson has been appointed Assistant Right of Way and Lease Agent for the Western Lines, with headquarters at Winnipeg.

Chicago, Rock Island & Pacific.—F. C. Herr has been appointed Superintendent of Police, with office at Chicago, succeeding L. M. Custy, resigned.

Delaware, Lackawanna & Western.—We are informed that the newspaper reports regarding changes in the operating department of this company are without foundation.

Delaware & Hudson.—E. R. Allen has been appointed Inspector of Station Service. This is a new office.

El Paso & Southwestern.—Thomas Paxton. Master Mechanic of the St. Louis, Iron Mountain & Southern at Argenta (Baring Cross), Ark., has resigned, to take a similar position on the E. P. & S. W. Mr. Paxton's office will be at Douglas, Ariz.

Erie.—H. S. Stebbins has been appointed Assistant General Eastern Freight Agent, with office at New York.

Great Northern.—H. E. Byram, hitherto General Superintendent (South Western District) of the Chicago, Rock Island & Pacific, has been appointed Superintendent of the G. N., with headquarters at Larimore, N. Dak., succeeding J. C. Howard, resigned.

Houston & Texas Central.—William Doherty, Assistant General Passenger Agent, has resigned. (See St. Louis, Brownsville & Mexico.)

Intercolonial.—A. B. McHaffie, hitherto Foreman Locomotive Shops at Moncton, N. B., has been appointed Master Mechanic,

with headquarters in that city, succeeding H. Ashton, resigned.

North Shore (California).—George W. Heintz, General Freight and Passenger Agent, has resigned.

Peoria & Pekin Terminal.—George F. Nevins has been appointed Assistant General Freight Agent, with headquarters at Peoria, Ill.

St. Louis, Brownsville & Mexico.—William Doherty, hitherto Assistant General Passenger Agent of the Houston & Texas Central, has been appointed General Passenger Agent of the St. L., B. & M., with headquarters at Corpus Christi, Texas.

St. Louis, Iron Mountain & Southern.—See El Paso & Southwestern.

San Francisco & Northwestern.—H. C. Phillips, Engineer of the Western Grand Division of the A., T. & S. F., at La Junta, Col., has been appointed Chief Engineer of the S. F. & N. W., with headquarters at San Francisco, Cal., succeeding W. B. Storey.

LOCOMOTIVE BUILDING.

The Atlantic Coast Line is having 15 locomotives built at the Baldwin Locomotive Works.

The Nashville, Chattanooga & St. Louis is having four locomotives built at the Baldwin Locomotive Works.

The Chicago & Western Indiana is about to order three mogul (2-6-0) locomotives and three suburban locomotives.

The Northern Pacific has ordered 26 freight and five passenger locomotives from the Schenectady Works of the American Locomotive Co.

CAR BUILDING.

The Great Northern has ordered 500 cars from Haskell & Barker.

Armour & Company are reported to be in the market for 300 refrigerator cars.

The Michigan Central has ordered 77 box cars from the American Car & Foundry Co.

The Baltimore & Ohio is reported to be in the market for 250 refrigerator cars of 60,000 lbs. capacity.

The Copper Range is having 10 freight cars built at McKees Rocks works of the Pressed Steel Car Co.

The Northern Pacific has ordered 500 box cars of 80,000 lbs. capacity from the Western Steel Car Co. These cars are to be built with the same specifications as the cars included in a similar order reported in our issue of June 3.

BRIDGE BUILDING.

ATLANTA, GA.—Bids will be received until August 15 by the City Engineers for building a concrete or steel bridge over the tracks of the Central of Georgia and Atlanta & West Point railroads at the Magnolia street crossing. The bridge will be 282 ft. long. General plans and specifications may be obtained at the office of the Clerk of the City Council. R. M. Clayton is City Engineer.

BADEN, ONT.—It is stated that a new steel bridge will shortly be erected at New Prussia, Ont. The bridge will cost about $5,000 and it is said that bids will shortly be asked.

BELLINGHAM, WASH.—Plans have been completed for building a drawbridge over Nooksack river. The plans have been submitted to the Secretary of War for approval. R. L. Kline is County Clerk.

BOSTON, MASS.—The Harbor and Land Commissioners have approved the plans for a new steel bridge across Fort Point avenue from Atlantic avenue to the New England freight yards on the South Boston side. The bridge will have two fixed spans 149 ft. long and a draw span 275 ft. long. Before the bridge can be built the plans must be approved by the Secretary of War at Washington.

BURLINGTON, KAN.—Bids will be received by the County Commissioners until August 11 for building a steel bridge 218 ft. long over the Neosho river. J. J. Sims is County Clerk.

BUSTLETON, PA.—Plans for two bridges to be built by the Philadelphia & Reading over Pennypack Creek have been approved by the Board of City Surveyors. The bridges are on the line of the proposed New York Short Line cut-off.

CALIBOGIE, ONT.—Bids will be received until August 13 for building the stone and concrete piers and steel superstructure of a bridge 84 ft. long across Madawaska river. Plans may be obtained from J. L. Morris, Engineer, at Pembroke.

KNOXVILLE, TENN.—The contract for building the viaduct over McCallie avenue is reported to have been let to the Converse Bridge Co., of Chattanooga, at $58,000.

MONTGOMERY, ALA.—The Montgomery Bridge Company has been organized to build a steel toll bridge over the Alabama River.

NEW YORK, N. Y.—Bids for building the electric railroad on the Williamsburg bridge across East River have been opened by Commissioner Best. The lowest bid for building overhead trolley lines was $108,000, made by Naughton & Co. The lowest bid for building conduit lines was $248,560, made by the Snare & Triest Co.

ST. CATHARINES, ONT.—Bids are being asked until August 27 by the Secretary of the Department of Railways and Canals for the substructures of two new bridges over the Welland canal, one at Allanburg and the other at Marlatt's Crossing. Plans may be seen at the office of the Superintending Engineer at St. Catharines.

SHARPSVILLE, PA.—The contract for rebuilding the bridge recently destroyed by heavy floods, has been let to the Pennsylvania Bridge Co., of Beaver Falls. The contract amounts to $23,680.

Other Structures.

ABRAMS, PA.—The Philadelphia & Reading has let a contract to Smith & Campion for the grading and masonry work on the new coal storage plant at Abrams, on the main line, above Bridgeport. The estimated cost is $1,000,000.

BEULAH, MISS.—The station of the Yazoo & Mississippi Valley at Beulah has been destroyed by fire. The loss is estimated at about $10,000.

BOSTON, MASS.—An unoccupied grain elevator of the New York, New Haven & Hartford, situated at Chandler and Berkeley streets, in the Back Bay district of Boston, was burned to the ground on July 30. The loss is estimated at $100,000.

CANTON, OHIO.—A contract has been signed by the Board of Trade and the Wheeling & Lake Erie for rebuilding the car shops of the railroad company which were recentiy destroyed by fire. The city agrees to pay a bonus of $10,000 towards securing additional land. The railroad company will enlarge the shops and will also straighten its line through the city.

DU BOIS, PA.—The new station which the Buffalo & Susquehanna is about to build on Brady street will be a two-story structure, 70 ft. long, and 40 ft. wide. The contractor is H. Murdock, of New York City.

DUTCHESS JUNCTION, N. Y.—Plans are being made by the New York Central & Hudson River for a new station.

GRAND RAPIDS, MICH.—The Grand Trunk is reported to be buying land for a new station in Grand Rapids.

HONESDALE, PA.—The Delaware & Hudson is to repair two abandoned coal docks at Honesdale. These docks have a capacity of 500,000 tons.

LANSFORD, PA.—According to press reports, the Lehigh Coal & Navigation Co. has plans for extensive improvements to its shops at Lansford. It is stated that a new locomotive shop and several machine shops will be built.

OMAHA, NEB.—The Chicago Great Western, it is reported, has let a contract for its freight house, on which work will be commenced soon.

UTICA, N. Y.—An 18-stall engine house and a coal trestle are to be built by the Lackawanna R. R. The coal trestle will have a capacity of 250 tons.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ADAIR COUNTY.—An officer writes that work is now in progress on this proposed road in Adair County, Mo. The line will be five miles long and the work is very light. Cameron, McManus & Joyce, Keokuk, Iowa, are the contractors. J. G. Trimble, Kansas City, Mo., is President, and E. M. Collins, Chief Engineer. (July 22, p. 41.)

ATLANTA, KNOXVILLE & NORTHERN.—It is reported that contracts will be let within 10 days for reconstructing the main line between Knoxville, Tenn., and Wetmore. The work will include the building of about 19 miles of new line. J. H. Peyton is Chief Engineer.

CANADIAN PACIFIC.—An officer writes that the proposed line from Toronto north to Sudbury will cost about $8,000,000, of which $2,000,000 will be required for the 58 miles between Romford and Byng Inlet, where the country is extremely rough and the work involves a large amount of rock cutting. The bridge over the French River will cost about $300,000. The maximum grade will be .3 per cent. and the maximum curvature will be 4 deg. Work will be begun at once on the section between Romford and Byng Inlet.

DETROIT BELT LINE.—According to press reports, plans are well under way for building a new belt line in and about Detroit. It is stated that a company has been organized with a capital of $1,000,000 and that surveys are now in progress. The entire line will be about 25 miles long. P. N. Jacobson, Detroit, Mich., may be addressed.

FLORIDA EAST COAST.—According to press reports, surveys are now in progress for an extension from Homestead, 28 miles south of Miami, south of Key West, about 136 miles. It is said that work will be begun about October 1. E. B. Carter, St. Augustine, Fla., is the Engineer in charge.

LOUISVILLE & NASHVILLE.—Surveys are reported in progress on the proposed extension of the Birmingham, Selma & New Orleans division of this road between Myrtlewood, Ala., the present terminus, and the Tombigbee river. R. Montford, Louisville, Ky., is Chief Engineer.

LOWVILLE & BEAVER RIVER.—A contract has been let to J. T. Campbell, of Lowville, N. Y., for building this road from Lowville to Croghan, 10 miles. Work will be begun at once. F. S. Easton, Lowville, N. Y., may be addressed. (July 15, p. 35.)

OHIO RIVER & WESTERN.—An amendment to the charter has been issued at Columbus granting the company power to build the new extension from Alledonia northeast to Bellaire, 20 miles. Surveys are now in progress. The new branch will open up extensive coal mines in Eastern Ohio.

OKLAHOMA, TEXAS & NEW MEXICO.—A charter has been granted this company in Oklahoma Territory with an authorized capital of $10,000,000. It is proposed to build a railroad from Woodward, Okla. T., through Dalhart to El Paso, Texas. Connection will be made with the Panhandle division of the Atchison, Topeka & Santa Fe at Woodward. J. H. Conlen, Dalhart, Texas, is president, and W. C. Edwards, General Manager.

RICHMOND, FREDERICKSBURG & POTOMAC.—According to newspaper reports, work will soon be begun on a large freight yard at Alexandria, Va.

SOMERSET RAILROAD.—An officer writes that the contract for grading the first 10 miles of this road has been let to Mitchell & Johnston, of Oakland, Me. The road will be used for logging purposes and will be 56 miles long, extending from a junction with the Canadian Pacific, about 40 miles north of Bingham, Me., in a general northerly direction. The work will include two steel bridges. W. M. Ayer, Oakland, is Manager. (July 29, p. 47.)

SOUTHERN PACIFIC.—Press reports state that this company is about to build a cut-off from Wabuska, Nev., to Hazen, 27 miles. It is said that work will be begun within 60 days. The cut-off, as projected, will avoid several very heavy grades in the vicinity of Moundhouse, Nev.

YREKA & SCOTT VALLEY.—Articles of incorporation have been filed in California, with an authorized capital of $750,000. It is proposed to build a railroad from Yreka, Cal., into the Scott Valley. C. H. Morrison is President and J. E. Harmon, Secretary.

RAILROAD CORPORATION NEWS.

ATCHISON, TOPEKA & SANTA FE.—The preliminary statement of this company for the fiscal year ending June 30, 1904, shows an increase in gross earnings of $5,820,805 over the preceding year. Operating expenses increased $3,784,922, leaving an increase in net earnings of $2,035,880. After payment of taxes and rentals, the income for the year was $23,646,566, an increase of $1,852,604. The statement for June is favorable, showing an increase in gross earnings for the month of $379,792.

ATLANTIC COAST LINE.—Consent has been granted this company by the Florida Railroad Commission to buy and operate the Jacksonville & Southwestern which runs from Jacksonville, Fla., to Newbury, 90 miles. It is officially stated that the road will be extended into Western Florida, probably as far as Tallahassee.

CANADIAN PACIFIC.—Announcement is made that the Lindsay, Bobcaygeon & Pontypool Railroad, running from Lindsay, Ont., to Burketon, on the Ontario Division of the C. P., has been leased to the C. P., and will be operated as a portion of the system, commencing August 8.

CARAQUET RAILROAD.—According to press reports, this railroad, which runs from Bathurst, N. B., to Tracadie Mills, 85 miles, has been bought by Peter Ryan and T. P. Coffee, both of Toronto, Canada. The road runs through a rich lumber country and will be used for logging purposes.

CENTRAL OF NEW JERSEY.—This company has made application to Justice Dixon in the Supreme Court for the appointment of a commission to condemn land in Bayonne for a line to Newark Bay and the Kill von Kull. The company is reported to have a plan for bridging or tunneling the Kill von Kull and by this means to run its lines through Staten Island and to Perth Amboy.

CINCINNATI, HAMILTON & DAYTON.—It is understood that the terms of the merger of the C., H. & D. and the Pere Marquette have been settled. The former road will lease the Pere Marquette on a 4 per cent. basis for the common stock this year, the guarantee to be later increased to 5 per cent.

CONNECTICUT RAILWAY & LIGHTING COMPANY.—Redmond & Co. and J. & W. Seligman & Co., of New York, are offering $1,500,000 of the first and refunding mortgage 4½ per cent. sinking fund guaranteed gold bonds of this company. These bonds are due in 1951, and are redeemable at 105 and accrued interest. The interest is guaranteed by the United Gas Improvement Company, of Philadelphia, which has paid dividends of 8 per cent. for the last seventeen years on its capital of $36,720,000.

GAINESVILLE, JEFFERSON & SOUTHERN.—One of the syndicate which recently purchased that portion of the G. J. & S. between Gainesville and Monroe writes that it is the intention of the syndicate to organize the Gainesville Midland Railroad Company to operate the road. The question of improving the property and extending the line will not be taken into consideration until next winter. Meanwhile, the road will be operated without any material change. G. J. Baldwin, President of the Savannah Electric Co., is interested. (July 15, p. 36.)

HARLEM RIVER & PORT CHESTER.—This company, the Harlem River branch of the N. Y., N. H. & H., has applied to the New York Railroad Commission for authority to issue a mortgage of $15,000,000. It is stated that $5,000,000 will be used to reconstruct the road and lay additional main tracks, and the balance to pay off an indebtedness of $8,500,000 to the New York, New Haven & Hartford.

ILLINOIS CENTRAL.—In pursuance of the plan to refund existing bonds of twelve subsidiary and controlled lines in Illinois and Indiana, this company has filed with the Union Trust Co., of New York, a trust deed, covering the property of all these twelve lines, to secure an issue of $20,000,000 of new first-mortgage gold bonds. These bonds bear 3½ per cent. interest and will become due July 1, 1952. The mortgage will be a first lien on the property of the 12 roads in question.

JACKSONVILLE & SOUTHWESTERN.—See Atlantic Coast Line above.

LACKAWANNA & WYOMING VALLEY.—It has been announced that the proceeds from the recent sale of the $4,000,000 five per cent. notes of the Westinghouse Electric Manufacturing Co. will be used to pay for the extension from Scranton, Pa., northeast to Carbondale, 17 miles, now building, and a tunnel in Scranton 4,700 ft. long.

NEW YORK CENTRAL & HUDSON RIVER.—This company has bought the Newburgh, Dutchess & Connecticut, which runs from Dutchess Junction, N. Y., on the Hudson division, northeastward to Millerton, N. Y., a distance of 58 miles. Connection is made at Hopewell Junction with the New York, New Haven & Hartford.

SOUTHERN PACIFIC.—A circular has been sent out to stockholders of the Southern Pacific Company concerning some of the details of the new $40,000,000 issue of preferred stock. The circular says that stockholders of the common stock of record July 28 will be entitled to subscribe up to the extent of 20 per cent. of their holdings to the preferred stock, at par, until September 1. Payments will be made in three instalments, the first, of 25 per cent., being paid on the date of subscription; the second, of 25 per cent., on or before October 1, and the remainder, of 50 per cent., on or before December 1.

TOLEDO RY. & TERMINAL.—Rudolph Kleybolte & Co., of New York, are offering at 103 and interest $1,000,000 first mortgage 4½ per cent. gold bonds of this company. These bonds are part of a mortgage of $3,500,000, which is a first lien on all property owned in the city of Toledo. The bonds are guaranteed jointly as to principal and interest by the Cincinnati, Hamilton & Dayton and the Pere Marquette.

WALTON COUNTY RAILROAD.—A petition has been filed with the Secretary of the State of Georgia for changing the name of this railroad from the Walton County to the Monroe Railroad. The company operates a line from Monroe to Social Circle, Ga., eight miles. The road was recently sold under foreclosure proceedings and was purchased by Jacob Phinizy, of Atlanta.

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CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

FRIDAY, AUGUST 5, 1904.

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